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SAMPLING PLANS FOR DURABILITY TESTING BEYOND REQUIREMENTS

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August 1985

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US ARMY BALLISTIC RESEARCH LABORATORY
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The Test and Evaluation Command funded the Experimental Design and Analysis Branch, SECAD, BRL to develop procedures for planning durability tests which allow testing an item beyond its required durability mission time so that statistical inferences concerning durability can be made with higher confidence. This report gives recommended procedures to accomplish this goal, summarizes the assumptions underlying these procedures, outlines the theory required for their development and gives tables and sampling plans which are needed to implement them.

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I. INTRODUCTION

The Test and Evaluation Command (TECOM) funded the Experimental Design and Analysis Branch, SECAD, BRL to develop procedures for planning durability tests which allow testing an item beyond its required durability mission time so that statistical inferences concerning durability can be made with higher confidence. This report gives recommended procedures to accomplish this goal, summarizes the assumptions underlying these procedures, outlines the theory required for their development and gives tables and sampling plans which are needed to implement them.

A durability test is conducted to collect data which is used to draw inferences concerning the probability that a unit which is to be evaluated will be able to operate for a minimum specified time, number of cycles, etc. without failure due to wearout. If one is willing to agree that units wear out gradually, i.e., the physical properties of a system gradually change with system usage and such changes adversely affect the effectiveness of the system, then one is led to the class of statistical distributions which are said to have an increasing failure rate. This is the class of distributions which have been used for the work described in this report.

The theory which underlies the procedures presented in this report is described in the appendices so that the mathematically inclined reader can satisfy his academic curiosity. The main body of the report is concerned with application of the procedures. The tables which are needed to use the procedures and listings of the computer programs which were used to construct these tables are given in the appendices.

II. PREVIOUS WORK

A durability life distribution function is a mathematical equation which is used to calculate the probability that the durability life of a unit will be at least as large as a value which is of interest to the engineer who is evaluating it. For sake of consistency with the statistical literature, we will let F(T) be the durability life distribution function, i.e., F(T) is the probability that the durability life is less than or equal to T and R(T) = 1-F(T) be the probability that durability life is greater than T. Clearly, the form of F(T) depends on the tasks which a unit is required to perform. For example, the F(T) for a vehicle which is required to ford streams and climb mountains would certainly differ from the F(T) for the same vehicle if it were only required to operate on interstate highways.

There are many equations which are used for F(T). Each has special properties which make it appropriate for use with a certain type of item. The two most commonly used are the Weibull distribution and a special form of this distribution which is known as the exponential distribution. The Weibull distribution has three parameters which can be adjusted so that the function adequately characterizes the durability distribution of many different types of equipment. If an engineer has sufficient knowledge about the form of the durability life of an item to guide him to a reasonable selection of the form of its durability distribution and sufficient data to estimate the parameters of his

postulated distribution, then he should use this information to determine whether the unit satisfies its durability requirement.

Usually little is known about the functional form of F(T). Since durability tests are almost always terminated before all units on test experience a durability failure, there is seldom sufficient data to calculate good estimates of the parameters of F(T), even if its form were known. This has led to the development of analytical techniques which require little knowledge about the form of F(T).

The distribution free procedure, which requires minimal knowledge about the form of F(T), is the one most frequently used today. For this procedure, a number of units, N, are selected as typical of the production design configuration of the item to be evaluated. These units are then tested under a specified set of test conditions for a durability time T*, which is the durability life requirement for the item. The number of units which survive the test, r, is used to calculate an estimate of the durability of the item represented by the sample. Thus, since N units are tested and r of them survive the test, the best estimate of durability is given r/N. The binomial distribution is used to construct a lower confidence limit for this estimate. If one is willing to use Bayesian procedures and postulate a uniform prior distribution for the binomial parameter, he can improve this estimate, i.e., he can construct a lower confidence limit for durability which is larger than the one found using the classical or frequentist approach to the problem. The improvement attained via this Bayesian approach is equivalent to having a sample size of N+1 with r+1 survivors using the frequentist approach (see Appendix A).

The distribution free procedure requires a large value of N if reasonable lower confidence limits for durability are needed. For example, if the appropriate requirement document specifies that a durability of at least .80 relative to a mission time of 5000 miles must be demonstrated with 95% confidence, then a sample size of 14 units must be tested for time $T* = 5000$ miles each, with no durability failures. If one durability failure is to be allowed, a sample size of 22 units must be tested for the same number of miles. If the item under evaluation had been a prototype vehicle, such sample sizes would not have been at all practical -- sample sizes of one to three would be much more reasonable.

This sample size problem can be circumvented to some degree if one tests for a time τ which is greater than T* and makes reasonable assumptions concerning the form of F(T). This approach would permit one to make the same inferences about the durability of a system relative to the mission time T* with a smaller number of test units. The only problem associated with this approach is the determination of "reasonable" assumptions concerning the form of F(T).

Billings (1967) introduced a concept which he called a moderately distribution free procedure. If F(T) is the probability distribution for durability life, then its first derivative with respect to T, f(T), is called the probability density function for durability life. Billings showed that if f(T) is an increasing function of T during the test period, then for any number, M, which is greater than one, the relationship $F(MT) \geq MF(T)$ holds.

He used this relationship to develop a methodology which improves on the distribution free lower confidence limit for durability when the actual test time for each unit is greater than T*. Billings' confidence limits can be improved by using Bayesian procedures. Though this work is mathematically interesting, it has not been used by test engineers because there seems to be little practical justification for the assumption that f(T) is increasing in T, especially if the actual test time is large relative to T*. For further discussion of this, see Appendix D.

Barlow and Proschan (1981) consider the family of durability probability distribution functions which have an increasing failure rate (IFR). For these distributions one need only assume that the item to be evaluated has the property that its remaining life is decreasing with usage, i.e., things wear out. They prove that if a complex system contains components which independently have IFR durability distributions, then the system has an increasing failure rate average (IFRA) life distribution. An IFRA durability distribution has the property that the average of the failure rate over time is increasing. It can be shown that an IFR durability distribution is IFRA but an IFRA durability distribution is not necessarily IFR. Aside from such generally accepted statements as, "90% of the tire trouble occurs in the last 10% of tire life," the mathematical proofs given by Barlow and Proschan adequately justify the use of their procedures based on IFRA distributions for durability testing at TECOM.

III. THE IFRA FAMILY OF DURABILITY DISTRIBUTIONS

A distribution F(T) is said to have IFRA if $-\ln[1-F(T)]/T$ is increasing in T, where T is greater than zero. This mathematical statement, which leads to a useful procedure for using survival data for equipment when test time exceeds durability requirement to construct improved lower confidence bounds for durability, has a practical interpretation. Simply stated, a system which has IFRA has the property that, even though there are brief periods during which it may be showing a slight decrease in failure rate due to something like work hardening, its failure rate is increasing when averaged over time. Mathematical developments which follow from the IFRA assumption are given in Appendix B.

The concept of IFRA evolved from the fact that most complex systems have components that wear out, i.e., are IFR. Barlow and Proschan (1967) proved that any reasonable system built from components having either exponential or IFR durability distributions will have an IFRA distribution. It can also be shown that if each of the independent components of a system has an IFRA distribution then the system has an IFRA distribution.*

Barlow and Proschan (1981) give another interesting justification for the use of the IFRA distributions. They prove that an IFRA distribution arises naturally when random shocks occur, each independently causing random damage to a device, the damages

*Theorem 2.6, Barlow and Proschan (1981).

accumulating until a critical threshold is exceeded, at which time the device fails. This is called the cumulative damage model.

Thus, the IFRA distributions seem to be a natural for durability testing and are totally consistent with the usual assumption that a unit which has been in the field for several years is more likely to wear out tomorrow than one which has been in the field for several months.

All of the mathematical models which underlie the procedures given in the remainder of this report are based on the assumption that the appropriate durability probability distributions are IFRA.

IV. DESIGN OF EXPERIMENTS

The durability requirement for an item, given in terms of some measure appropriate to the item, e.g., hours, cycles, miles, rounds, etc., should specify $T*$, the required durability life for the item, $R*$, the required durability relative to $T*$; and a level of confidence at which $R*$ must be demonstrated. Implicit in this requirement is the life profile for the item and the definition of a durability failure. Further discussion of these points can be found in Test Operations Procedure 1-2-502 (Reference 7).

If a durability test is to demonstrate the durability life of an item, two things must be determined, the number of units to be tested, N, and the time on test for each unit, τ. Procedures for selecting N and τ when the durability life of an item is IFRA are given below. A brief discussion of the theory underlying the procedure is given in Appendix B, and a more comprehensive derivation is given in Barlow and Gupta (1967).

Given α, the confidence coefficient, $T*$, and $R*$, Table F-1 can be used to select N, the number of units to put on test, and τ, the test time for each surviving unit, so that a $100(1 - \alpha)\%$ lower confidence limit for $R(T*)$, denoted as $R(\alpha,T*)$, will be at least $R*$ provided that the test time is τ and r units survive. It should be pointed out that each unit must remain on test until it either fails or has operated for time τ.

Since τ must be greater than $T*$, we can write $\tau = MT*$, i.e., $\tau/T* = M$, where M is a number greater than one. This permits construction of a concise table which has general application.

The use of Table F-1 to select a sample size is best illustrated with an example. Suppose that there is a requirement that a new gun tube must demonstrate a durability of at least .80 with 95% confidence when firing 2400 rounds of high velocity K.E. ammunition. That is to say, the requirement is to demonstrate with 95% confidence that the probability that tube life exceeds 2400 rounds is at least .80. Here $\alpha = .05$, $T* = 2400$ and $R* = .80$. Table F-1 gives sample sizes such that, if N units are each tested for 2400M rounds and $C = N - r$ units fail, then $R(.05, 2400)$ is at least .80 with at least 95% confidence. Of course, it is assumed that the R(T) for the gun tube is IFRA.

For this example α, T* and R(+2400) are all fixed and the test engineer is free to select N, M and C in such a way that the durability requirements are satisfied and, at the same time, the test can be run as cheaply as possible. If no durability failures are allowed, i.e., C = 0 and M = 1.7, so that all units on test must fire MT* = 1.7x2400 = 4080 rounds without a durability failure, then a sample of N = 8 gun tubes is required. This means that a total of 8x4080 = 32640 rounds would be fired. It is of interest to note that if the distribution free method were to be used for this demonstration, 2400 rounds would be fired from each of 14 gun tubes. That is, the number of rounds fired would be 14x2400 = 33600, only 960 rounds more than with the IFRA design. But six additional gun tubes would be required and this would also increase the cost of the test.

Quite often the number of units available for test is fixed. If this were the case in the above example and only N = 3 gun tubes were available for testing, then Table F-1 reveals that, if C = 0, i.e., no durability failures would be allowed, then M must be greater than 3, which is not recommended because extrapolation back from more than three times the durability requirement is mathematically undesirable. In this case, the test engineer would most likely request that the requirement for durability demonstration with 95% confidence be changed to durability demonstration with 80% confidence. The value of M from Table F-1 for this requirement is 2.6. Then 2.6x2400 = 6240 rounds would be fired from each of the three gun tubes, and if there were no durability failures, then the test would have demonstrated that the durability for a 2400 round mission is at least .80 with 82% confidence.

V. ESTIMATION OF DURABILITY

The previous section gave procedures for selecting sample sizes so that, if C or less failures were observed in a sample of N test units, a 100(1-α)% lower confidence limit for durability would be at least as large as a stated requirement. After the test has been completed and the resultant data becomes available for analysis, a better, i.e., higher, lower confidence limit for durability can usually be constructed. Also, point estimates of durability for any stated time requirement and time for which a specified durability is predicted can be generated when C > 0. As before, the IFRA durability distribution assumption is made. Methodology for doing the above is given in this section.

When a durability test has been completed the evaluator knows the number of units which were on test, the number of units which failed, the time at which each failure occurred and the time at which the experiment was terminated. If the termination time is the same as the required durability mission, time, i.e., T* = τ, then the best point estimate of R(T*) is given by $\hat{R}(T*)$ = r/N, no matter what form R(T) may have.

When τ is greater than T* and R(T) is IFRA, we know that R(T) is bounded below by the exponential durability distribution. That is to say, when $0 < T* \leq \tau$ then $R(T) \geq e^{-T*/\hat{\theta}}$, where $\hat{\theta}$ is an appropriate estimate of the mean of the bounding distribution. The maximum likelihood estimate for θ# is

See Appendix C for the derivation of this result.

$$\hat{\theta} = \frac{1}{C}\left[\sum_{i=1}^{C} T_i + (N-C)\tau\right], \qquad (1)$$

where $\sum_{i=1}^{C} T_i$ is the total time on test for units which fail and $(N-C)\tau$ is the total time on test for units which survive. Thus $\hat{\theta}$ is the total test time for all units divided by the number of durability failures.

It should be pointed out that $\hat{\theta}$, like many maximum likelihood estimates, is a biased estimate of θ. However, in this case the small positive bias seems desirable because it tends to compensate for the conservative bound for $R(T*)$ given by the exponential durability distribution.

For example, suppose four units were on test, one failed at 1095 hours and the remaining three were still operating at the test termination time of 2300 hours. Here $N=4$, $C=1$, $\tau = 2300$ and $\hat{\theta} = \frac{1}{C}[\sum_{i=1}^{C} T_i + (N-C)\tau] = 1095 + (3)2300 = 7995$ hours. If $T* = 1800$ hours then we would infer that $R(T*) = R(1800) = e^{-1800/7995} = .80$. However, if instead we have $T* = 1150$ hours, then we would infer that $R(1150) = e^{-1150/7995} = .87$.

Durability test data can also be used to construct lower confidence limits for durability. This is accomplished by constructing a lower confidence limit for the exponential parameter, θ, and using the exponential bound for the IFRA class of distributions. This requires knowledge of the sampling distribution of $\hat{\theta}$.

The exact distribution of $\hat{\theta}$ was derived by Bartholomew (1963) for the case in which $C > 0$. Unfortunately, the function derived by Bartholomew is mathematically complex and can not be expressed in closed form. A number of approximations for the distribution of $\hat{\theta}$ have been derived to circumvent this problem. If the test is terminated at a fixed time, then we suggest using the approximation that $2C\hat{\theta}/\theta$ has the chi-square distribution with 2C+1# degrees of freedom. This leads to the approximate $100(1-\alpha)\%$ lower confidence limit for θ:

$$\theta_L = 2C\hat{\theta}/\chi^2_{1-\alpha}(2C+1)\,. \qquad (2)$$

If $C=0$, we use the binomial distribution to construct a lower confidence limit for durability at time τ, set this equal to $R(\alpha,\tau)$, solve for θ_L and use this solution to find $R(\alpha,T*)$. A lower $100(1-\alpha)\%$ confidence limit for the binomial parameter P is given by the solution of the equation

$$\sum_{x=r}^{N} \binom{N}{x} P_L^{\,x}(1-P_L)^{N-x} = \alpha \qquad (3)$$

There are many approximations for this confidence limit. The one which is most common involves the use of a chi-square variate with 2C+2 degrees of freedom. Preliminary results from our study of the problem suggest that a chi-square with 2C+1 d.f., which has been considered by others, may be the best chi-square approximation. At this time we recommend using the chi-square approximation with 2C+1 d.f. because it gave confidence limits which are closest to the exact limits in a recent monte-carlo study.

for P_L. In this equation α is the confidence coefficient, r is the number of units surviving when the durability test is terminated, N is the number of units on test and P_L is the lower confidence for durability. $r = N$ when $C = 0$ so that the equation becomes

$$P_L{}^N = \alpha \tag{4}$$

which has the solution

$$P_L = \alpha^{1/N} . \tag{5}$$

But, when we use the exponential bound for the IFRA class of distributions $P_L = R(\alpha,\tau) = e^{-\tau/\theta_L} = \alpha^{1/N}$. This equation has the solution

$$\theta_L = -N\tau/\ln(\alpha) . \tag{6}$$

Substituting this solution in our equation for $R(\alpha,T*)$ leads to

$$R(\alpha,T*) = e^{\frac{T*\ln(\alpha)}{N\tau}} = e^{\ln(\alpha^{\frac{T*}{N\tau}})} \tag{7}$$

$$= \alpha^{\frac{T*}{N\tau}} = \alpha^{\frac{1}{NM}}$$

where $M = \dfrac{\tau}{T*}$ is the ratio of test termination time to durability mission requirement time. Of course, our requirement that τ must be greater than or equal to T* dictates that M must be greater than one. The above turns out to be a reasonably good approximation which is adequate for a back-of-the-envelope analysis in many cases.

Fortunately, the computing power required to numerically integrate the exact probability density function of $\hat{\theta}$ is now generally available and exact lower confidence limits for θ can be constructed. A computer program for this purpose has been written and is available on the BRL CYBER computer for general use. A listing of this program is given in Appendix E.

Given θ_L, the lower confidence limit for θ, then a bound for the lower confidence limit for durability for time T* is given by

$$R(\alpha,T*) = e^{-T*/\theta_L} . \tag{8}$$

In the example above we had $\tau = 2300$, $N = 4$, $C = 1$ and $\hat{\theta} = 7995$. The exact 90% lower confidence limit for θ is $\theta_L = 3053$ so that a 90% lower confidence limit for durability for time T* is

$$R(.10,T*) = e^{-T*/3053} . \tag{9}$$

For sake of comparison, we calculate the approximate lower confidence limit for θ to be

$$\theta_L = \frac{2C\hat{\theta}}{\chi^2_{.90}\,(2C+1)} = \frac{2(1)(7995)}{6.25} = 2558. \tag{10}$$

These exact and approximate bounds, $\tilde{R}(\alpha,T*)$, were calculated for several values of T* and are shown in Table 1. Point estimates are included in the table as reference points.

TABLE 1.

Point and interval estimates of durability; four units on test, one failed at 1095 hours. Test terminated at 2300 with three units surviving.

T*	R(T*)	R(.10,T*)	$\tilde{R}$(.10,T*)	ERROR
500	.94	.85	.82	-.03
1000	.88	.72	.68	-.04
1500	.83	.61	.56	-.05
2000	.78	.52	.46	-.06
2500	.73	.44	.38	-.06

Inspection of Table 1 reveals that, for this example, the chi-square approximation compares favorably, i.e., the error relative to the exact value is small. This table also shows that the approximation is conservative, i.e., $\tilde{R}(.10,T*) < R(.10,T*)$. These are not general properties of the approximation. They apply only to this specific example and no attempt should be made to extend them to other problems. We are now conducting a study which should identify the best procedure for constructing approximate lower confidence limits for the exponential parameter when durability test data is available. We are also exploring the possibility of constructing charts and/or tables which can be used to find exact lower confidence limits for the exponential parameter without recourse to a large computer.

Both the exact and approximate confidence given above exist only if one or more durability failures occur during a test. This is a result of the fact that $\hat{\theta}$ is not defined for C=0. If C=0 then a point estimate for durability exists only if $T* = \tau$ and, in this case, it is unrealistically one.

If, as in the previous example, four units were on test and the test was terminated after 2300 hours with all units surviving, then, for T* = 1150 we have M = 2 and

$$R(.10,1150) = (.1)^{\frac{1}{8}} = .7499 \,. \tag{11}$$

VI. TABLE USAGE WITH EXAMPLES

The tables given in Appendices F, G and H are appropriate for items whose durability probability distribution functions have increasing failure rate average (IFRA). An IFRA durability distribution has the property that the average of the failure rate over time is increasing. The IFRA distributions seem to be appropriate for durability testing since it seems natural that the likelihood of a failure increases as the amount of testing increases and the items wear out. (See Section III for more details.)

A. Table F-1.

Table F-1 can be used to determine the number of items needed for a durability test when the following items are specified: durability requirement, number of failures allowed, desired confidence level and M. M is defined as: M = test time/durability criterion. Time is a generic term used to represent miles, cycles, number of rounds, actual time, or any other measure of operation sequence.

The tables have been generated for the following values:

Confidence Level:	.95, .90, .80, .70, .60, .50
Durability:	.50, .60, .70, .80, .90, .95
Number of Failures:	0, 1, 2, 3, 4, 5, 10, 25
M:	1.0 to 2.0 by 0.1
	2.0 to 3.0 by 0.2 .

Suppose that we are interested in demonstrating that a truck has a durability probability of 0.80 after being driven for 5000 miles at a confidence level of 0.90. We decide that we will accept one failure, given that the other trucks have been driven 8000 miles each. How many trucks do we need to test?

For this example:

$$M = \frac{\text{test time}}{\text{durability criterion}} = \frac{\tau}{T*} = \frac{8000}{5000} = 1.6$$

$$R* = \text{durability} = 0.80$$

$$\text{Confidence Level} = 1 - \alpha = 0.90$$

$$\text{Number of Failures (C)} = 1 \quad .$$

Go to the 10th page of Table F-1. Under the Durability column heading of .80, go to the row for M = 1.6 and read the values 12 and .92. This indicates that if 12 trucks are put on test for 8000 miles each and if at most one failure occurs, then our durability is 0.80 with confidence of at least 0.92. Due to the discreteness of the data, the true confidence level is higher than the stated confidence level.

Let's assume that it is learned that we cannot get 12 trucks but the durability requirement has been reduced to 0.70. Then we can move to the left in the same row and read under .70, 8 and .93. This indicates that if 8 trucks are put on test for 8000 miles each and no more than one failure occurs, then we can state that our durability is 0.70 with confidence of at least 0.93.

B. Table G-1.

Table G-1 can be used to determine M, the normalized test time for surviving units, i.e.,

$$M = \frac{\text{test time}}{\text{durability criterion}} = \frac{\tau}{T*} . \tag{12}$$

In order to find M, the following items need to be specified: confidence level, durability, number of failures allowed and number of test units.

The tables have been generated for the following values:

Confidence Level:	.50, .60, .70, .75, .80, .85, .90, .95, .99
Durability:	.50, .60, .70, .75, .80, .85, .90, .95
Number of Failures:	0, 1
Number Test Items:	2 thru 10.

Suppose we have four tanks available for testing the durability of the gun tube. The specifications for the gun tube state that the durability should be .70 after firing 1000 rounds with no more than one failure with confidence of .80. How many rounds should we plan on shooting from each tank gun tube in order to meet the requirements?

For this example,

N = number of units on test = 4
C = number of failures allowed = 1
R* = durability = 0.70
Confidence Level = 1 - α = 0.80

$$M = \frac{\text{test time}}{\text{durability criterion}} = \frac{\tau}{T*} = \frac{\tau}{1000} . \tag{13}$$

Go to the 12th page of Table G-1. Under the Durability Column heading of 0.70, go to the row for CONF = .80 and read M = 2.449. Then

$$\tau = 1000 \bullet M = 2449 . \tag{14}$$

This indicates that 2449 rounds need to be fired from each gun tube, with no more than one failure, in order to meet the specified conditions.

C. Table H-1

Table H-1 can be used to determine the sample size required to demonstrate a mean durability (i.e., the required durability life) with a certain minimum confidence level. In order to use the tables the following items need to be specified. The confidence level, the number of allowable failures and two of the following: M, τ and T*.

$$M = \frac{\tau}{T*} \tag{15}$$

Thus, if any two are known, the third can be calculated.

The tables have been generated for the following values:

Confidence Level:	.95, .90, .80, .70, .60, .50
Number of Failures:	0 thru 10
M:	1.1 to 2.0 by 0.1
	2.0 to 3.0 by 0.2 .

Suppose that we wish to demonstrate that the mean durability of combat boots is 10 months with 95% confidence. We plan on testing the boots for 12 months and are willing to allow up to six failures.

For this example:

$$M = \frac{\text{test time}}{\text{durability criterion}} = \frac{12}{10} = 1.2$$

$$\text{Confidence Level} = 1 - \alpha = 0.95$$

$$C = \text{number of allowable failures} = 6 \ .$$

Go to the second page of Table H-1. Under the C=6 column, go to the row for M = 1.2 and read N = 35 and true confidence = .95. (Due to the discreteness of the data, the true confidence may be higher than the stated confidence level.) This indicates that if we put 35 pairs of combat boots on test for 12 months and get no more than 6 failures, the mean durability is equal to or greater than 10 months with at least a 95% confidence level.

Instead of determining N, Table H-1 could be used to determine test time if the following items were specified: C, 1 - α, durability criterion and N. For example, let's set up another boot test. Say N = 20, C = 8, 1 - α = .90 and we want the mean durability equal to or greater than 12 months. Go to the fourth page of Table H-1. Under the C=8 column, go down the column until N=20 is found, then read the M associated with this value M=1.5. We can then calculate test time = M • durability criterion = 1.5 (12) = 18.

Thus, if we put 20 pairs of boots on test for 18 months and observe no more than eight failures, then the mean durability is equal to or greater than 12 with at least a 92% confidence level.

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APPENDIX A. DISTRIBUTION FREE (BINOMIAL) CONFIDENCE LIMITS

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In a test to determine the durability of an item, N units are tested for a required durability life, T*, and the number of units which survive, r, is noted. The probability that the durability life of a unit is less than or equal to T is given by the function F(T). Thus, the probability that the durability life satisfies the requirement is $1 - F(T*) \equiv R(T*)$. If no assumption concerning the mathematical form of R(T) is made, a lower confidence limit for durability, R(T*), of a unit can be constructed using the binomial distribution. Such a confidence interval is called "distribution free" because it does not depend on the distribution of T. That is, it is a valid interval no matter what the function R(T) may be.

Two methods are commonly used to construct a distribution free lower confidence limit for R(T). These are the classical or frequentist approach and the Bayesian approach. Both methods are based on the probability statement,

$$P\,\{R(T*) \geq R(\alpha,T*)\,\} = 1 - \alpha\,, \tag{A1}$$

where the confidence coefficient, α, satisfies the condition $0 < \alpha < .5$. Thus, if $\alpha = .05$ the probability that the durability of a unit is greater than or equal to R(.05,T*) is .95.

For the frequentist approach R(T*) is considered to be an unknown constant so that the probability that exactly r units in a sample of N have durability life greater than or equal to T* is given by the binomial expression

$$\binom{N}{r}\, R(T*)^{r}\,(1 - R(T*))^{N-r} \tag{A2}$$

and the probability that r or more units have durability life greater than or equal to T* is given by

$$\sum_{i=r}^{N} \binom{N}{i}\, R(T*)^{i}\,(1 - R(T*))^{N-i}\,. \tag{A3}$$

A $100(1-\alpha)\%$ lower confidence limit for R(T*) is found by solving the equation

$$\sum_{i=r}^{N} \binom{N}{i}\, R(\alpha,T*)^{i}\,(1 - R(\alpha,T*))^{N-i} = \alpha \tag{A4}$$

for $R(\alpha,T*)$. This leads to the probability statement, $P\{R(T*) \leq R(\alpha,T*)\} = \alpha$. Here we claim that if R(T*) is less than or equal to $R(\alpha,T*)$, it would be most unusual for r or more units to survive the test. For example, if $\alpha = .05$, the probability that r or more units would survive the test if $R(T*) \leq R(\alpha,T*)$ is less than or equal to .05.

For the Bayesian approach to the problem R(T) is assumed to be a random variable and a prior distribution is specified for it. The beta distribution is usually chosen for the Bayesian prior distribution of the binomial parameter because of its desirable mathematical properties. Like the binomial parameter, the beta random variable can take on only values between zero and one; the distribution has two parameters, A and B, which can be chosen so that it can take on a wide spectrum of shapes; and the

mathematics required for constructing confidence limits are relatively simple.

In the absence of an understanding of the prior distribution of R(T*), the uniform distribution is usually assumed. This is a special form of the beta distribution with parameters $A = B = 1$. This implies that R(T*) is equally likely to take on any value between zero and one, i.e.,

$$f_1\,(R(T*)) = 1 \;\; ; \;\; 0 \leq R(T*) \leq 1 \qquad\qquad (A5)$$
$$= 0 \;\; ; \;\; \text{otherwise.}$$

Similar to the frequentist approach

$$f_2\,(r\,|\,R(T*)) = \binom{N}{r} R(T*)^r\,(1 - R(T*))^{N-r}\,,\; r = 0,1,\ldots,N \qquad (A6)$$

is the conditional distribution of r given R(T*). It follows that the joint distribution of r and $R(T_0)$ is given by

$$f_3\,(r,R(T*)) = f_1\,(R(T*))\,f_2\,(r\,|\,R(T*)) \qquad (A7)$$
$$= \binom{N}{r} R(T*)^r\,(1 - R(T*)^{N-r} \qquad 0 \leq R(T*) \leq 1,\; r = 0, 1, \ldots, N$$
$$= 0 \qquad \text{Otherwise .}$$

The marginal distribution of r is found by integrating equation (A7) with respect to R(T*), i.e.,

$$f_4\,(r) = \int_0^1 \binom{N}{r} R(T*)^r\,(1 - R(T*))^{N-r}\,dR(T*) \qquad (A8)$$
$$= \frac{1}{N+1} \qquad ; r = 0, 1, \ldots, N\,.$$

It is interesting to note that we started with a continuous uniform marginal distribution for R(T*) and found that r has a discrete uniform marginal distribution.

Bayes theorem specifies that the conditional distribution of R(T*) given r is

$$f_5\,(R(T*)\,|\,r) = \frac{f_3\,(r,R(T*))}{f_4\,(r)} \qquad (A9)$$
$$= \frac{\binom{N}{r} R(T*)^r\,(1 - R(T*))^{N-r}}{\frac{1}{N+1}}$$
$$= \frac{\Gamma\,(N+2)}{\Gamma\,(r+1)\,\Gamma\,(N-r+1)}\,R(T*)^r\,(1 - R(T*))^{N-r}$$

which is a beta distribution with parameters $A = r+1$ and $B = N-r+1$. A Bayesian

$100(1-\alpha)\%$ lower confidence limit for R(T*) is given by the solution of the integral equation

$$\int_0^{R(\alpha,T*)} \frac{\Gamma\,(N+2)}{\Gamma\,(r+1)\,\Gamma\,(N-r+1)}\; R(T*)^r\,(1-R(T*))^{N-r} = \alpha\,. \tag{A10}$$

If we integrate the left hand side of the equation (A10) by parts, we find that

$$\int_0^{R(\alpha,T*)} \frac{\Gamma\,(N+2)}{\Gamma\,(r+1)\,\Gamma\,(N-r+1)}\; R(T*)^r\,(1-R(T*))^{N-r} \tag{A11}$$

$$= \sum_{i=r+1}^{N+1} \binom{N+1}{i}\; R(\alpha,T*)^i\,(1-R(\alpha,T*))^{N-i} = \alpha\,.$$

Comparing equation (A4) with equation (A11) reveals that the Bayesian lower confidence limit for R(T*) when N units are tested and r units survive is the same as the frequentist lower confidence limit for R(T*) when N+1 units are tested and r+1 units survive. Thus, the additional assumptions for the Bayesian analysis with a uniform prior distribution for R(T*) are equivalent to an increased frequentist sample size of one unit which survives.

APPENDIX B. INCREASING FAILURE RATE AVERAGE SYSTEMS

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The failure rate for a durability distribution is defined to be

$$r(T) = \frac{f(T)}{1 - F(T)} \cdot \tag{B1}$$

Clearly $r(T)\ \Delta T$ is the probability that an item which has survived to time T will experience a durability failure at some time between T and $T + \Delta T$. For example, if $f(T) = \lambda e^{-\lambda T}$, i.e., the durability life has the exponential distribution, then $R(T) = e^{-\lambda T}$ and $r(T)\ \Delta T = \lambda\ \Delta T$. In this case, the probability of a durability failure in a time interval of length ΔT depends only on ΔT and not on the time T. Thus, items with an exponential durability life don't wear out. Their failure rate is constant over time. Such items tend to operate without a durability failure until it experiences a random external pulse or shock which induces failure.

A durability distribution is said to have an increasing failure rate (IFR) if $r(T) \leq r(T + \Delta T)$ for all T and positive ΔT. Any item which wears out has IFR, i.e., the older it is the more likely it is to experience a durability failure during the next hour, mile, cycle, etc.

A durability distribution is defined to have an increasing failure rate average (IFRA) if the average value of r(T) increases over time. The average value of r(T) over the interval from time 0 to time T is

$$\bar{r}(T) = \frac{1}{T}\int_0^T r(t)\,dt = \frac{1}{T}\int_0^T \frac{f(t)}{1 - F(t)}\,dt = \tag{B2}$$

$$\frac{1}{T}\int_0^T \frac{-d\,(1 - F(t))}{1 - F(t)}\,dt = -\frac{1}{T}\left[\ln\,(1 - F(t))\right]_0^T =$$

$$-\frac{1}{T}\ln\,(1 - F(T))\,.$$

A system consisting of two independent subsystems in parallel where the subsystems have exponential durability with parameters λ_1 and λ_2 is an example of a system which has IFRA durability but not IFR durability. For such a system,

$$\begin{aligned} F(T) &= (1 - e^{-\lambda_1 T})\,(1 - e^{-\lambda_2 T})\,, \\ f(T) &= \lambda_1\, e^{-\lambda_1 T}\,(1 - e^{-\lambda_2 T}) + \lambda_2\, e^{-\lambda_2 T}\,(1 - e^{-\lambda_1 T})\,, \\ r(T) &= \frac{f(T)}{1 - F(T)} = \frac{\lambda_1\, e^{-\lambda_1 T} + \lambda_2\, e^{-\lambda_2 T} - (\lambda_1 + \lambda_2)\, e^{-(\lambda_2 + \lambda_2)T}}{e^{-\lambda_1 T} + e^{-\lambda_2 T} - e^{-(\lambda_1 + \lambda_2)T}}\,, \end{aligned} \tag{B3}$$

and

$$\bar{r}(T) = -\frac{1}{T}\ln\left[1 - F(T)\right] = -\frac{1}{T}\ln\left[e^{-\lambda_1 T} + e^{-\lambda_2 T} - e^{-(\lambda_1 + \lambda_2)T}\right]. \tag{B4}$$

The failure rate and average failure rate for such a system with $\lambda_1 = .3$ and $\lambda_2 = .7$ are plotted on Figure B.1.

If a system has IFRA, then for any M satisfying the condition $M \geq 1$, $T/M \leq T$ and

$$\bar{r}\,(T/M) = \frac{-\ln\,(1 - F(T/M))}{T/M} \leq \frac{-\ln\,(1 - F(T))}{T} = \bar{r}\,(T) \tag{B5}$$

so that

$$\ln\,(1 - F(T/M))^M \geq \ln(1 - F(T)) \tag{B6}$$

or

$$\Big[1 - F(T/M)\Big]^M \geq 1 - F(T)$$

or

$$\Big[R(T/M)\Big]^M \geq R(T)\,. \tag{B7}$$

Equation (B7) can be used to construct a $100(1 - \alpha)\%$ lower confidence limit for $R(T*)$ under the IFRA model, where $T*$ is a durability life requirement.

If N units are tested for time $\tau > T*$ and r units survive the test, then we can construct a distribution free lower confidence limit (frequentist or Bayesian) for $R(T*)$ which has the property

$$P\left\{ R(\tau) \leq R(\alpha,\tau) \right\} = \alpha. \tag{B8}$$

Since $\tau > T*$ we can write $T* = T/M$, with $M \geq 1$. It then follows from equations (B7) and (B8) that

$$P\left\{ R(\tau/M)^M \leq R(\alpha,\tau) \right\} \leq \alpha \tag{B9}$$

and

$$P\left\{ R(\tau/M) = R(T*) \leq R(\alpha,T*)^{1/M} \right\} \leq \alpha\,, \tag{B10}$$

that is, $R(\alpha,\tau)^{1/M}$ is an at least $100(1 - \alpha)\%$ lower confidence limit for durability relative to durability life requirement $T*$.

Similar arguments can be developed to construct confidence limits for the mean, median and other quantiles of IFRA systems. Barlow and Proschan (1981) give an excellent treatment of this subject.

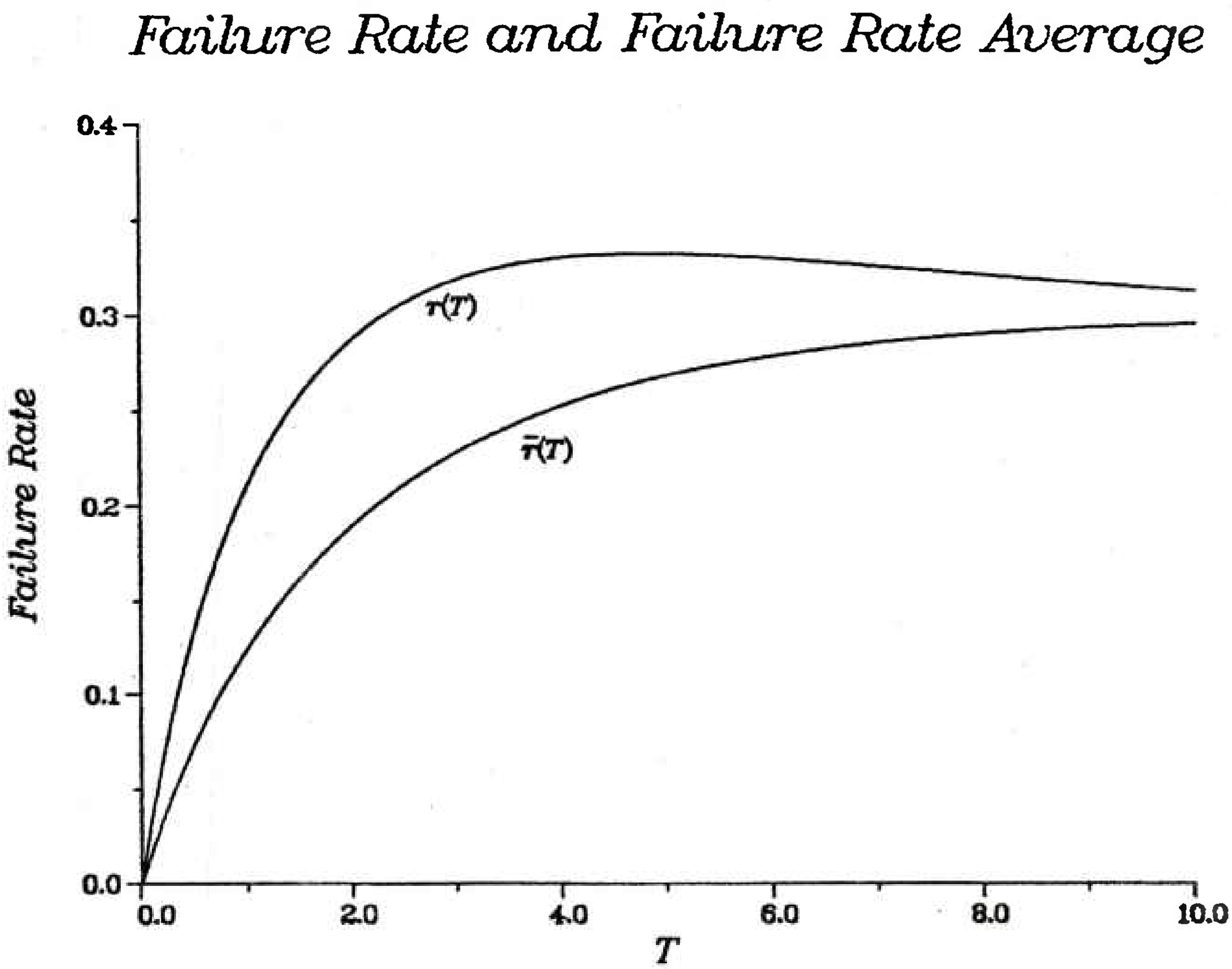

Figure B1. Failure rate and average failure rate for a system consisting of two independent subsystems with exponential durability in parallel. In this case, both subsystems are IFR but the system is IFRA because $\bar{r}(T)$ is increasing even though $r(T)$ is decreasing for $T > 3.86$.

APPENDIX C. THE EXPONENTIAL DISTRIBUTION

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The exponential distribution is one of the most useful probability distributions for modeling in life testing. It adequately characterizes many realistic processes and its mathematical simplicity makes it easy to use. It also has the property that it bounds the distributions which are in the IFR and IFRA families. These distributions are basic to the theory of durability testing. It is this last property which makes it important to the work described in this report.

For the sake of completeness, some of the mathematical properties of the exponential distribution are developed in this appendix. Examples which demonstrate the use of exponential distribution theory are also given.

The user of the procedures developed in this report need not fret with the details given in this appendix unless he is motivated by scientific curiosity. The remainder of the report can be used without referring to this appendix.

A random variable, T, is said to have the exponential life distribution if its probability density function is of the form

$$f(T)^{\#} = \frac{1}{\theta} e^{-T/\theta}; \qquad T \geq 0, \theta > 0. \tag{C1}$$

It follows from (C1) that the probability that a unit with an exponential life distribution will fail at or before time T is given by the distribution function

$$F(T) = \int_0^T \frac{1}{\theta} e^{-T/\theta} \, dT = 1 - e^{-T/\theta}; \qquad T \geq 0. \tag{C2}$$

The probability that the life of such a unit will be greater than T is

$$R(T) = 1 - F(T) = e^{-T/\theta}. \tag{C3}$$

In this report we often refer to R(T) as the durability function.

The mean of the exponential distribution is

$$\int_0^\infty \frac{T}{\theta} e^{-T/\theta} \, dT = \theta; \tag{C4}$$

and the variance is

$$\int_0^\infty \frac{(T-\theta)^2}{\theta} e^{-T/\theta} \, dT = \theta^2. \tag{C5}$$

The q'th quantile, T_q, is given by solving for T_q in

\# This probability density function is sometimes expressed in the form $f(T) = \lambda e^{-\lambda T}$. We chose the form (C1) so that the expected value of T would be θ rather than $1/\lambda$.

$$P\left\{T \leq T_q\right\} = q = 1 - e^{-T_q/\theta}, \tag{C6}$$

which has solution $T_q = -\theta \ln(1 - q) = -\ln(1 - q)^{\theta}$. Thus, the median of the distribution is

$$T_{.5} = -\theta \ln(.5) = (.6931)\,\theta, \tag{C7}$$

that is, the median is less than the mean and the distribution has positive skewness, i.e., it is skewed right (see Figure C1).

The important characterizations of durability life are θ, the average durability life; R(T), the probability that the durability life of a randomly selected item will exceed time T; and T_q, the q'th quantile of the durability life distribution. Recall, T_q is that life which will be exceeded with probability 1 - q.

Estimation of θ, R(T) and T_q is somewhat of a problem in durability testing. In the durability life problem feasible test time is usually short relative to the actual durability life of an item. That is, if a vehicle has an actual durability life of 100,000 miles it is unlikely that it would be practical to test it that long. Practicality dictates the selection of a test termination (truncation) time, τ. N items are tested until each either operates for time τ or suffers a durability failure. If C items fail, the total test time for all items is

$$A = \sum_{i=1}^{C} T_i + (N - C)\,\tau, \tag{C8}$$

where T_i is the failure time for the i'th failed item.

The likelihood function for our test with truncation at time τ is

$$\begin{aligned} L &= \left(\frac{1}{\theta}\right)^{C} \prod_{i=1}^{C} e^{-T_i/\theta} \left[e^{-\tau/\theta}\right]^{N-C} \\ &= \left(\frac{1}{\theta}\right)^{C} e^{-A/\theta}. \end{aligned} \tag{C9}$$

Now

$$\ln(L) = -C\ln(\theta) - A/\theta$$

so that

$$\frac{d}{d\theta}\ln(L) = \frac{-C}{\hat{\theta}} + \frac{A}{\hat{\theta}^2} = 0$$

and the maximum likelihood estimate of θ is

$$\hat{\theta} = A/C. \tag{C10}$$

where A is given in relationship (C8). The above estimate of θ can be used to estimate other characteristics of durability life (see Table C-1).

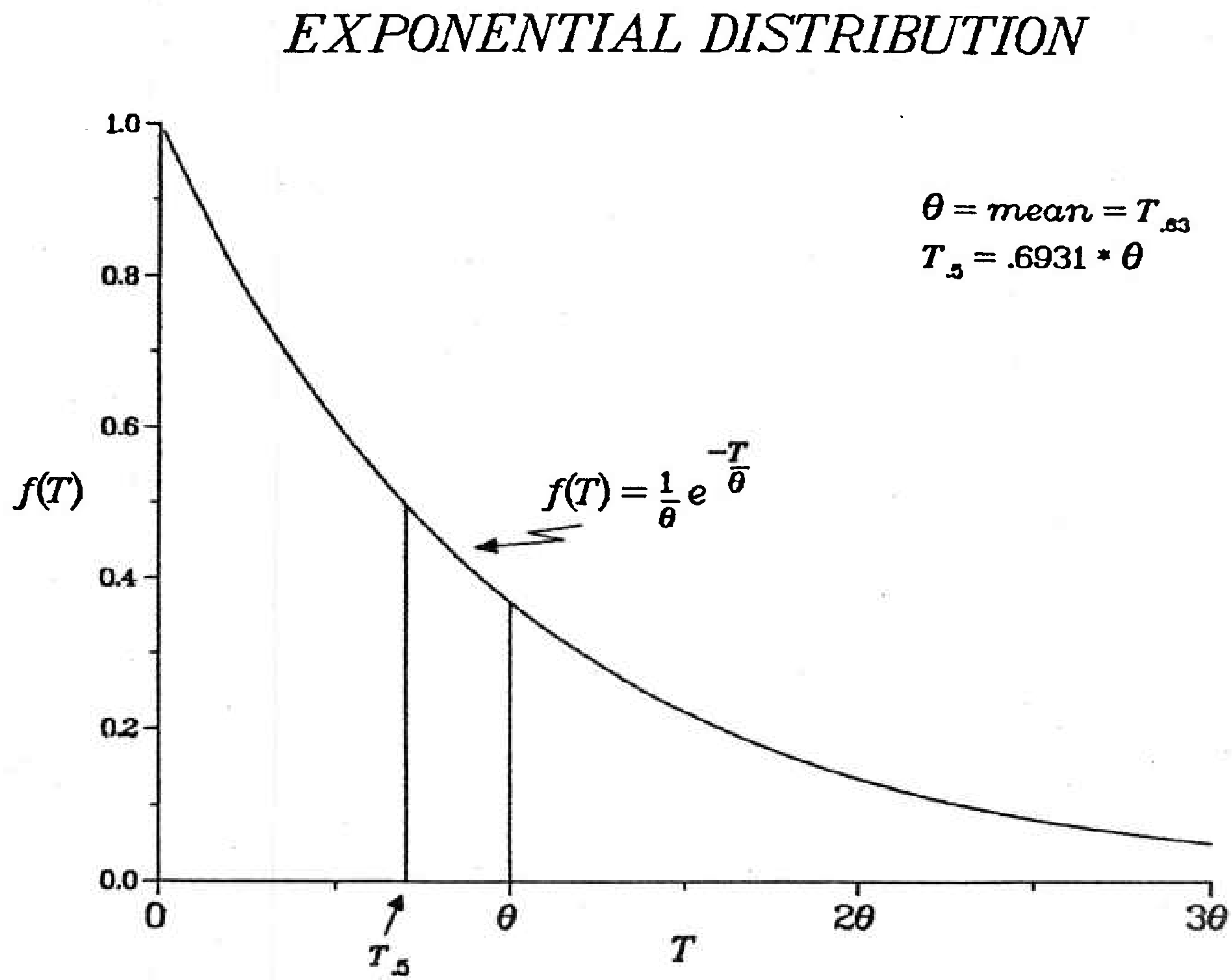

Figure C1. The exponential distribution. The median is -ln(.5)*θ = .6931*θ, the mean is θ and the area to the left of (below) the mean is .6321*θ.

We have found that $\hat{\theta}$, as defined above, is approximately distributed as a chi-square variate with 2C + 1 degrees of freedom.* This approximation is used to give the lower confidence limits in Table C-1.

Bartholomew (1963) derived the exact distribution of $\hat{\theta}$ when $C \neq 0$. A computer program which uses his results to construct exact lower confidence limits for θ is given in Appendix E.

Clearly, the maximum likelihood estimate of θ is not defined when C = 0 (see Equation C10).

TABLE C-1. Estimates of durability distribution properties for time truncated test with one or more failures.

PROPERTY	(POINT) ESTIMATE#	APPROX. L.C.L. [100(1–α)%]
Mean (Ave) Durability	$\hat{\theta} = \frac{1}{C} A$	$\theta_L = \frac{2A}{\chi^2_{1-\alpha}(2C+1)}$
q'th quantile of durability life	$T_q = \hat{\theta} \ln(1-q)$	$T_{q_L} = \frac{-2A\ln(1-q)}{\chi^2_{1-\alpha}(2C+1)}$
Median durability life	$T_{.5} = \hat{\theta} \ln(2)$	$T_{.5_L} = \frac{2A\ln(2)}{\chi^2_{1-\alpha}(2C+1)}$
Durability for test time τ	$\hat{R}(\tau) = e^{-\tau/\hat{\theta}}$	$R(\alpha,\tau) = \exp\left[\frac{-(\tau)\chi^2_{1-\alpha}(2C+1)}{2A}\right]$
Durability for mission time $T* = \tau/M$	$\hat{R}(\tau/M) = e^{-\tau/M\hat{\theta}} = \left[\hat{R}(T*)\right]^{1/M}$	$R(\alpha,T*) = \left[R(\alpha,T*)\right]^{1/M}$

\# Test truncated at time τ with one or more durability failures. Durability mission time is $T* = \tau/M$, C = number of durability failures and A = total test time = $\sum_{i=1}^{C} T_i + (N-C)\,\tau$.

* There are many approximations for this confidence limit. The one which is most common involves the use of a chi-square variate with 2C+2 degrees of freedom. Preliminary results from our study of the problem suggest that a chi-square with 2C+1 d.f., which has been considered by others, may be the best chi-square approximation. At this time we recommend using the chi-square approximation with 2C+1 d.f. because it gave confidence limits which are closest to the exact limits in a recent monte-carlo study.

However, we can construct lower confidence limits by combining distribution free procedures (see Appendix A) with properties of the exponential distribution.

First, we note that a $100(1-\alpha)\%$ distribution free lower confidence limit for $R(\tau)$ is given by the solution of the equation

$$\sum_{i=N-C}^{N} \binom{N}{i} \left[R(\alpha,\tau)\right]^{i} \left[1-R(\alpha,\tau)\right]^{N-i} = \alpha. \tag{C11}$$

Thus, when $C = 0$,

$$R(\alpha,\tau) = \alpha^{1/N}. \tag{C12}$$

We next take another approach to this problem. Assume that $\hat{\theta}$, if it existed, has the approximate chi-square distribution with 2C, rather than 2C+1 degrees of freedom and that, if we had continued testing for time $\tau > +\delta$, $\delta = 0$, there would have been one durability failure at that time. It is easy to show that $\chi^2_{1-\alpha}(2) = -2\ln\alpha$. In this case $A = N\tau$. From Table C-1, we see that

$$\begin{aligned} R(\alpha,\tau) &= e^{-\tau\chi^2_{1-\alpha}(2)/2A} \\ &= e^{-\tau(-2\ln\alpha)/2N\tau} \\ &= e^{\ln\alpha^{1/N}} \\ &= \alpha^{1/N}, \end{aligned} \tag{C13}$$

which is the same as the distribution free lower confidence limit for $R(\tau)$.

Using this approach, i.e., substituting $-2\ln\alpha$ for $\chi^2_{1-\alpha}(2C+1)$ in Table C-1, leads to the lower confidence limits for the case $C = 0$ which are given in Table C-2.

TABLE C-2. **Lower confidence limits for durability distribution properties for a time truncated test with zero failures.**

PROPERTY	APPROXIMATE 100(1–α)% L.C.L.
Mean (Ave.) Durability	$\theta_L = A/\ln\alpha$
q'th quantile of reliability life	$T_{q_L} = A \ln (1 - q)/\ln \alpha$
Median durability life	$T_{.5_L} = - A \ln(2)/\ln \alpha$
Durability for test time τ	$R(\alpha,\tau) = \alpha^{1/N}$
Durability for mission time $T* = \tau/M$	$R(\alpha,T*) = \alpha^{\frac{1}{NM}}$

APPENDIX D. BILLINGS' MODERATELY DISTRIBUTION FREE PROCEDURE

APPENDIX D. BILLINGS' MODERATELY DISTRIBUTION FREE PROCEDURE

Billings (1967) placed the requirement

$$Tf(T) \geq F(T)\,; \qquad 0 < T \leq T_0 \tag{D1}$$

on the durability probability distribution and density functions. A pictorial representation of this assumption is given in Figure D1.

If (D1) is satisfied, then it follows that, on the interval $(0,\ T_0]$

$$\frac{f(T)}{F(T)} \geq \frac{1}{T} \tag{D2}$$

and for any number $M > 1$,

$$\int_{T}^{MT} \frac{f(T)\,dT}{F(T)} \geq \int_{T}^{MT} \frac{dT}{T} \tag{D3}$$

so that

$$\ln F(MT) - \ln F(T) \geq \ln (MT) - \ln(T) \tag{D4}$$

or, equivalently,

$$\ln \left[\frac{F(MT)}{F(T)}\right] \geq \ln \left[\frac{MT}{T}\right] \tag{D5}$$

which leads to

$$F(MT) \geq M\,F(T)\,. \tag{D6}$$

Billings used equation (D6) to construct confidence bounds on durability life for a stated durability life requirement, $T*$.

Suppose each of N units is tested until it fails or for time $MT*$, whichever comes first. The probability that any particular unit will experience a durability failure during the test is $F(MT*)$. If Y units fail during the test then a $100(1-\alpha)\%$ upper confidence limit for $F(MT*)$ is given by the solution of the equation

$$\sum_{X=0}^{Y} \binom{N}{X} F_U(MT*)^X \left[1 - F_U(MT*)\right]^{N-X} = \alpha \tag{D7}$$

for $F_U(MT*)$.

If $F_U(MT*)$ is the solution of (D7) then we can make the probability statement

$$P\left\{ F(MT*) \geq F_U(MT*) \right\} = \alpha\,. \tag{D8}$$

Since $MF(T*) \leq F(MT*)$ it follows that

$$P\left\{MF(T*) \geq F_U(MT*)\right\} \leq \alpha \tag{D9}$$

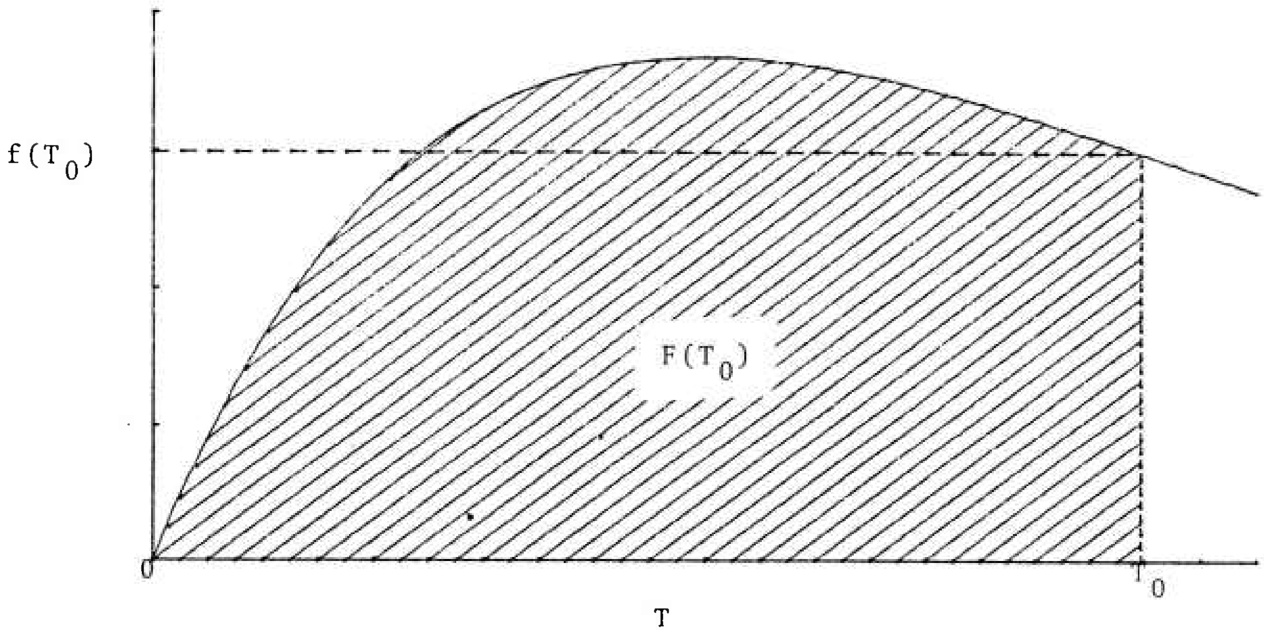

Figure D1. Illustration of a durability distribution for which $Tf(T) \geq F(T)$ for all T satisfying $0 < T \leq T_0$. Here $T_0 f(T_0)$ is the area under the rectangle bounded by the axes and the dashed lines and $F(T_0)$ is the area in the hatched region under the curve.

$$= P\left\{F(T*) \geq F_U\,(MT*)/M\right\}$$

$$= P\left\{1 - F(T*) \leq 1 - F_U\,(MT*)/M\right\}$$

so that

$$P\left\{R(T*) \leq 1 - F_U\,(MT*)/M\right\} \leq \alpha\,. \tag{D10}$$

← poor notation. Suggest: $R_\alpha(T^*)$.

Thus, $1 - F_U\,(MT*)/M = R(\alpha T*)$ is at least a $100(1 - \alpha)\%$ lower confidence limit for R(T*), which is the probability that the durability life is a randomly selected unit that will exceed the requirement, T*.

For the special case in which no units fail during the test time MT*, $Y = 0$ and equation (D7) had the form

$$\left[1 - F_U\,(MT*)\right]^N = \alpha \tag{D11}$$

so that

$$F_U\,(MT*) = 1 - \alpha^{1/N}\,. \tag{D12}$$

It follows from equation (D10) that $1 - (1 - \alpha^{1/N})/M$ is an at least $100(1 - \alpha)\%$ lower confidence limit for R(T*).

Billings (1968) uses equation (D7) to refine the probability statement made in equation (D10) when $Y > 0$. This work leads to the relationship

$$P\left\{R(T*) \leq 1 - \frac{k}{M}\,F_U\,(MT*)\right\} \leq \alpha\,, \tag{D13}$$

where $k \geq 1$ depends on N and α. The details of this work, which are mathematically tedious, are not given here.

APPENDIX E. LISTINGS OF COMPUTER PROGRAMS

APPENDIX E. LISTINGS OF COMPUTER PROGRAMS

```
C------------------------------------------------
C    THIS PROGRAM FINDS THE LOWER CONFIDENCE LIMIT (THETA)
C    FOR A DURABILITY STUDY GIVEN :
C                 ALPHA
C                 SAMPLE SIZE (N)
C                 TERMINATION TIME (T)
C             AND  THETA(NOT)
C
C    ALPHA = PROB ( THETA .GE. THETA(NOT) )
C------------------------------------------------

      PROGRAM CONF (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE8)
      DIMENSION IRAY(6),THETA(1)
      REAL EPS,EPS2,ETA
      INTEGER NSIG,NO,ITMAX,IER
      COMMON ALPHA,N,T,THENOT
      EXTERNAL F
      DATA IRAY/6* -0/
C----SET PRINT LIMIT TO ZERO
      IRAY(4) = 0

C----ALPHA = PR(THETA HAT .GE. THETA NOT) =
C----1/ (1-EXP(-N*T/THETA)) [SUM FROM K=1 TO N](COMB(N,K) *
C----[SUM FROM I=0 TO K](COMB(K,I) * (-1)**I *
C----EXP(-T/THETA(N-K+I)) *
C----INTEGRAL FROM X TO INF OF P(CHI**2 W 2K DF) D(CHI**2) 2K

      WRITE (6,100)
 100  FORMAT (' ALPHA LEVEL')
      READ (5,*) ALPHA
      WRITE (6,110)
 110  FORMAT (' SAMPLE SIZE')
      READ (5,*) N
      WRITE (6,120)
 120  FORMAT (' TRUNCATION TIME')
      READ (5,*) T
      WRITE (6,130)
 130  FORMAT (' THETA(NOT)')
      READ (5,*) THENOT


       EPS   = 0.0
       NSIG  = 4
       XL    = THENOT/20
       XR    = 10
       ITMAX= 100

C----CALL SYSTEMC TO INHIBIT PRINTING OF ERROR 115
C----AND START ERROR SUMMARY ACCUMULATION
```

```
      CALL SYSTEMC(115,IRAY)

      CALL ZFALSE (F,EPS,NSIG,XL,XR,XAPP,ITMAX,IER)

      WRITE (6,600) XAPP,ALPHA,N,T,THENOT
  600 FORMAT (' THE LOWER CONFIDENCE LIMIT = ',F12.5//
     *' FOR       ALPHA = ',F6.4/
     *'               N = ',I5/
     *'               T = ',F12.5/
     *'      THETA(NOT) = ',F12.5)

      STOP
      END

C-----------------------------------------------------------
      REAL FUNCTION F(THETA)
      REAL THETA
      REAL A,B,T,X,DF,P,IERR,FACT1,FACT2,SUM1,SUM2,TEETHE,VALUE
      REAL  PROD1,PROD2,Z,ALPHA,THENOT,TOTAL,EPF,EPF2,ETA
      INTEGER N,K,I,NN,KK,II,NSIG,ITMAX,NO
      COMMON ALPHA,N,T,THENOT

      A = 1 / (1 - EXP(-N*T/THETA) )
      TEETHE = -T / THETA

C-----SUM2 = [SUM FROM K=1 TO N](COMB(N,K) *
C-----[SUM FROM I=0 TO K](COMB(K,I) * (-1)**I *
C-----EXP(-T/THETA(N-K+I))

      SUM2 = 0
      FACT2 = 1.0
      PROD2 = 0
      NN = N
      DO 10 K = 1,N
        FACT2 = FACT2 * NN/K

        SUM1 = 0
        PROD1 = 0
        KK = K
        DO 20 I = 0,K
          IF (I .EQ. 0) THEN
            FACT1 = 1
          ELSE
            FACT1 = FACT1 * KK/I
            KK = KK - 1
          END IF
          PROD1 = FACT1 * (-1)**I * EXP(TEETHE * (N-K+I))

C--Z = 1-(INT(FROM X TO INF) OF P(CHI**2 W DF=2K) D(CHI**2) DK)

          DF = 2*K
          VALUE = THENOT - T/K * (N-K+I)
          IF (VALUE .LE. 0) THEN
```

```
          Z = 1.
        ELSE
          IF (THETA .LT. 0) THEN
            Z = 1
            GO TO 50
          ELSE
          END IF
          X = 2*K/THETA * (VALUE)
          CALL MDCH(X,DF,P,IERR)
          Z = 1 - P
C          WRITE(6,*) Z
        END IF

 50     PROD1 = PROD1 * Z
        SUM1 = SUM1 + PROD1
 20   CONTINUE

      PROD2 = FACT2 * SUM1
      SUM2 = SUM2 + PROD2
      NN = NN-1

 10 CONTINUE

    F = (A * SUM2) - ALPHA

    RETURN
    END
```

PROGRAM USED TO GENERATE TABLE F-1

```
C    THIS PROGRAM GIVES A TABLE OF THE SAMPLING PLAN FOR THE
C    DURABILITY OF IFRA DISTRIBUTIONS
C
C    INPUTS ARE:
C    DESIRED CONFIDENCE LEVEL (DCL) AND NUMBER OF FAILURES (C)
C
      PROGRAM BARLOW (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE8,TAPE9)
      DIMENSION NTOTAL(20,20),TRUECL(20,20),TIME(16),DUR(6)
      INTEGER C

      REAL P,DCL,PDF,CDF,TCDF,R,T1
C    NTOTAL  = TOTAL SAMPLE NUMBER
C    TRUECL  = TRUE CONFIDENCE LEVEL
C    TIME    = THE MULTIPLE OF TIME THAT IS MULTIPLIED BY
C              DURABILITY CRITERION TO GET TOTAL TEST TIME
C    DUR     = DURABILITY CRITERION

C    INPUT VALUES FOR TIME AND DURABILITY CRITERION:

      DATA TIME/1.0,1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,
     +          2.0,2.2,2.4,2.6,2.8,3.0/
      DATA DUR/.50,.60,.70,.80,.90,.95/

      WRITE (6,100)
  100 FORMAT ('DESIRED CONFIDENCE LEVEL ')
      READ (5,*) DCL
      WRITE (6,110)
  110 FORMAT ('NO. OF FAILURES ')
      READ (5,*) C

C    TABLE SET-UP

      WRITE (9,120) DCL,C
  120 FORMAT ('1',25X,'SAMPLING PLAN FOR THE DURABILITY OF IFRA',
     +' DISTRIBUTIONS',//,37X,' DESIRED CONFIDENCE LEVEL = ',
     +F3.2,/,37X,' NUMBER OF FAILURES (C) = ',I1,//)
      WRITE (9,130)
  130 FORMAT (1X,98('-'))
      WRITE (9,140)
  140 FORMAT (' :',10X,':',30X,'DURABILITY ',44X,':')
      WRITE (9,203)
      WRITE (9,150) (DUR(M),M=1,6)
  150 FORMAT (' :',10X,':',5X,5(F3.2,11X),F3.2,7X,':')
      WRITE (9,190)
  190 FORMAT (' :    M *    :',85('-'),':')
      WRITE (9,170)
      WRITE (9,180)
  170 FORMAT (' :           :  ',5(' N    TRUE     '),' N    TRUE   :')
  180 FORMAT (' :           :  ',5('      C.L.     '),'      C.L.   :')
      WRITE (9,130)
      WRITE (9,203)
C
```

```
C    FOR EACH MULTIPLE OF TIME AND EACH DURABILITY CRITERION,
C    THE NUMBER OF TEST ITEMS (SAMPLE SIZE) AND TRUE CONFIDENCE
C    LEVEL ARE CALCULATED.
C
     PDF = 0
     CDF = 0
     PPP = 1 - DCL

     DO 10 I = 1,16
      T1 = TIME(I)
      N = C + 1

       DO 20 J = 1,6
        R = DUR(J)
        P = 1 - (R**T1)
 55      CALL BINOM (PDF,CDF,N,P,C)
        IF (CDF .LE. PPP) THEN
          TCDF = 1-CDF
          NTOTAL(I,J) = N
          TRUECL(I,J) = TCDF
        ELSE
          N = N+1
          GO TO 55
        END IF
 20     CONTINUE
 10  CONTINUE

C    THE NUMBER OF UNITS AND THE TRUE CONFIDENCE LEVEL
C    ARE PRINTED IN THE TABLE

     I = I-1
     J = J-1
     DO 40 II = 1,I
      WRITE (9,200) TIME(II),(NTOTAL(II,JJ),TRUECL(II,JJ),JJ=1,J)
200   FORMAT (' :',2X,F4.1,4X,':',1X,6(I4,2X,F4.2,4X),':')
      WRITE (9,203)
203   FORMAT (' :',10X,':',85X,':')
 40  CONTINUE
     WRITE (9,203)
     WRITE (9,205)
205  FORMAT (1X,98('-'))
     WRITE (9,210)
210  FORMAT (1X,/,' *  M = TEST TIME/DURABILITY CRITERION'/////)
     STOP
     END


C    THIS SUBROUTINE FINDS THE PROBABILITY DENSITY FUNCTION
C    AND CUMMULATIVE DENSITY FUNCTION GIVEN THE SAMPLE SIZE
C    (N), THE P-VALUE, AND THE NUMBER OF FAILURES (C).

     SUBROUTINE BINOM (PDF,CDF,N,P,C)
     REAL PDF,CDF,P
     INTEGER C
```

```
      PDF = (1-P)**N
      CDF = PDF
      IF (C .NE. 0) THEN
        P1 = P/(1-P)
        DO 30 K = 1,C
          PDF = PDF * (N-K+1) * P1/K
          CDF = CDF + PDF
30      CONTINUE
      ELSE
      END IF


      RETURN
      END
```

PROGRAM USED TO GENERATE TABLE G-1

```
C     THIS PROGRAM CREATES A FILE THAT WILL LIST A TABLE OF
C     A SAMPLING PLAN FOR THE MEAN OF IFRA DISTRIBUTIONS.

C     NTOTAL  = NUMBER OF TEST ITEMS ( SAMPLE NUMBER )
C     TRUECL  = TRUE CONFIDENCE LEVEL
C     TIME    = MULTIPLE OF TIME THAT THE DURABILITY CRITERION
C               IS MULTIPLIED BY TO OBTAIN THE TOTAL TEST TIME
C     FAILURE = C = NUMBER OF FAILURES ALLOWED IN A SAMPLE

C     C RANGES FROM 0 TO 5

      PROGRAM BARLOW (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE8,TAPE9)
      DIMENSION NTOTAL(20,20),TRUECL(20,20),TIME(15),FAILURE(11)
      INTEGER C,FAILURE
      REAL P,DCL,PDF,CDF,TCDF,R,T1,A,L

      DATA TIME/1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,
     +          2.0,2.2,2.4,2.6,2.8,3.0/
      DATA FAILURE/0,1,2,3,4,5,6,7,8,9,10/

C     INPUT THE DESIRED CONFIDENCE LEVEL

      WRITE (6,100)
  100 FORMAT ('DESIRED CONFIDENCE LEVEL ')
      READ (5,*) DCL

C     WRITE THE TITLE AND COLUMN HEADINGS

      WRITE (9,120) DCL
  120 FORMAT ('1',25X,'SAMPLING PLAN FOR THE MEAN OF IFRA',
     +' DISTRIBUTIONS',//,37X,' DESIRED CONFIDENCE LEVEL = ',
     +F3.2,//)
      WRITE (9,130)
  130 FORMAT (1X,98('-'))
      WRITE (9,140) (FAILURE(M),M=1,6)
  140 FORMAT (' :',10X,':',2X,'C = ',I2,12X,4(I2,12X),I2,7X,':')
      WRITE (9,150)
  150 FORMAT (' : F(TIME)* :',85('-'),':')
      WRITE (9,170)
      WRITE (9,180)
  170 FORMAT (' :          : ',5('TEST  TRUE    '),'TEST  TRUE  :')
  180 FORMAT (' :          : ',6('ITEMS  C.L.    '),':')
      WRITE (9,130)
      WRITE (9,190)
  190 FORMAT (' :',10X,':',85X,':')


C     PDF = PROBABILITY DENSITY FUNCTION
C     CDF = CUMMULATIVE DENSITY FUNCTION

      PDF = 0
      CDF = 0
```

```
      DO 10 I = 1,15
       T1 = TIME(I)

       A = 1 - DCL
       DO 20 L = A,1,.1
        F = 1-L-EXP(-L*T1)
        IF (F .GT. 0) THEN
          GO TO 35
        ELSE
          A = L - .1
          B = L
          GO TO 25
        END IF
   35  CONTINUE
   20  CONTINUE

C      FIND W

   25  CALL W1(A,B,T1,W)

C      FOR EACH VALUE OF THE NUMBER OF FAILURES, C, FIND
C      THE TRUE CONFIDENCE LEVEL, TCDF, SUCH THAT TCDF
C      IS GREATER THAN OR EQUAL TO THE DESIRED CONFIDENCE
C      LEVEL, DCL.

        DO 30 J = 1,6
          C = FAILURE(J)
          P = 1-EXP(-W * T1)
          IF (C .EQ. 0) N = 1
  360      CALL BINOM (PDF,CDF,N,P,C)

          IF (CDF .LE. (1-DCL)) THEN
            TCDF = 1 - CDF
            NTOTAL(I,J) = N
            TRUECL(I,J) = TCDF
          ELSE
            N = N + 1
            GO TO 360
          END IF
   30   CONTINUE
   10 CONTINUE

C     WRITE THE TABLE INPUT:  TOTAL TIME/DURABILITY REQUIREMENT,
C     TEST ITEMS (SAMPLE SIZE), AND TRUE CONFIDENCE LEVEL.

      I = I-1
      J = J-1
      DO 40 II = 1,I
       WRITE (9,200) TIME(II),(NTOTAL(II,JJ),TRUECL(II,JJ),JJ=1,J)
  200   FORMAT (' :',2X,F4.1,4X,':',1X,6(I4,2X,F4.2,4X),':')
       WRITE (9,190)
   40 CONTINUE
```

```
      WRITE(9,190)
      WRITE (9,210)
210   FORMAT (1X,98('-'))
      WRITE (9,220)
220   FORMAT (1X,/,' * F(TIME) = TEST TIME/DURABILITY CRITERION'//)
      STOP
      END


C     COMPUTES W.  INPUT VALUES ARE A,B,T1.

      SUBROUTINE W1 (A,B,T1,W)
      REAL A,B,T1,W
        IF (ABS(1-A-EXP(-A*T1)) .GT. 1E-09 ) THEN
          IF ( ABS(1-B-EXP(-B*T1)) .GT. 1E-09 ) THEN
350         D = (A+B)/2
            IF (ABS(A-B) .LT. 1E-09) THEN
              W = A
            ELSE
              F = 1-D - EXP(-D*T1)
              IF ( ABS(F) .LT. 1E-09) THEN
                W = D
              ELSE
                IF ( F .GT. 0 ) THEN
                  A = D
                ELSE
                  B = D
                END IF
                GO TO 350
              END IF
            END IF
          ELSE
            W = B
          END IF
        ELSE
          W = A
        END IF
      RETURN
      END

C     COMPUTES THE CUMULATIVE DISTRIBUTION FUNCTION AND
C     PROBABILITY DENSITY FUNCTION USING THE BINOMIAL.
C     INPUT VALUES ARE N, P, C.

      SUBROUTINE BINOM (PDF,CDF,N,P,C)
      REAL PDF,CDF,P
      INTEGER C
      PDF = (1-P)**N
      CDF = PDF
      IF (C .NE. 0) THEN
        P1 = P/(1-P)
        DO 50 K = 1,C
          PDF = PDF * (N-K+1) * P1/K
          CDF = CDF + PDF
```

```
 50     CONTINUE
      ELSE
      END IF
      RETURN
      END
C     THIS IS PAGE TWO OF THE TABLE FOR 'SAMPLING PLAN FOR
C     THE MEAN OF IFRA DISTRIBUTIONS'
C
C     C RANGES FROM 6 TO 10
C

      PROGRAM BARLOW (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE8,TAPE9)
      DIMENSION NTOTAL(20,20),TRUECL(20,20),TIME(15),FAILURE(11)
      INTEGER C,FAILURE
      REAL P,DCL,PDF,CDF,TCDF,R,T1,A,L

      DATA TIME/1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,
     +        2.0,2.2,2.4,2.6,2.8,3.0/
      DATA FAILURE/0,1,2,3,4,5,6,7,8,9,10/

      WRITE (6,100)
  100 FORMAT ('DESIRED CONFIDENCE LEVEL ')
      READ (5,*) DCL

      WRITE (9,120) DCL
  120 FORMAT ('1',22X,'SAMPLING PLAN FOR THE MEAN OF IFRA',
     +' DISTRIBUTIONS',//,31X,' DESIRED CONFIDENCE LEVEL = ',
     +F3.2,//)
      WRITE (9,130)
  130 FORMAT (1X,84('-'))
      WRITE (9,140) (FAILURE(M),M=7,11)
  140 FORMAT (' :',10X,':',2X,'C = ',I2,12X,3(I2,12X),I2,7X,':')
      WRITE (9,150)
  150 FORMAT (' : F(TIME)* :',71('-'),':')
      WRITE (9,170)
      WRITE (9,180)
  170 FORMAT (' :          :  ',4('TEST  TRUE    '),'TEST  TRUE   :')
  180 FORMAT (' :          : ',5('ITEMS  C.L.   '),':')
      WRITE (9,130)
      WRITE (9,190)
  190 FORMAT (' :',10X,':',71X,':')
C
C
      PDF = 0
      CDF = 0

      DO 10 I = 1,15
       T1 = TIME(I)

       A = 1 - DCL
       DO 20 L = A,1,.1
        F = 1-L-EXP(-L*T1)
        IF (F .GT. 0) THEN
          GO TO 20
```

```
      ELSE
        A = L - .1
        B = L
        GO TO 25
      END IF
 20  CONTINUE

 25  CALL W1(A,B,T1,W)

      DO 30 J = 7,11
        C = FAILURE(J)
        P = 1-EXP(-W * T1)
        IF (C .EQ. 6) N = 1
360       CALL BINOM (PDF,CDF,N,P,C)

        IF (CDF .LE. (1-DCL)) THEN
          TCDF = 1 - CDF
          NTOTAL(I,J) = N
          TRUECL(I,J) = TCDF
        ELSE
          N = N + 1
          GO TO 360
        END IF
 30    CONTINUE
 10 CONTINUE

    I = I-1
    J = J-1
    DO 40 II = 1,I
      WRITE (9,200) TIME(II),(NTOTAL(II,JJ),TRUECL(II,JJ),JJ=7,J)
200    FORMAT (' :',2X,F4.1,4X,':',1X,5(I4,2X,F4.2,4X),':')
      WRITE (9,190)
 40  CONTINUE

    WRITE (9,190)
    WRITE (9,210)
210  FORMAT (1X,84('-'))
    WRITE (9,220)
220  FORMAT (1X,/,' *  F(TIME) = TEST TIME/DURABILITY CRITERION'//)
    STOP
    END

    SUBROUTINE W1(A,B,T1,W)
    REAL A,B,T1,W
      IF (ABS(1-A-EXP(-A*T1)) .GT. 1E-09 ) THEN
        IF ( ABS(1-B-EXP(-B*T1)) .GT. 1E-09 ) THEN
350         D = (A+B)/2
          IF (ABS(A-B) .LT. 1E-09) THEN
            W = A
          ELSE
            F = 1-D - EXP(-D*T1)
            IF ( ABS(F) .LT. 1E-09) THEN
              W = D
            ELSE
```

```
            IF ( F .GT. 0 ) THEN
              A = D
            ELSE
              B = D
            END IF
            GO TO 350
          END IF
        END IF
      ELSE
        W = B
      END IF
    ELSE
      W = A
    END IF
  RETURN
  END

  SUBROUTINE BINOM (PDF,CDF,N,P,C)
  REAL PDF,CDF,P
  INTEGER C
  PDF = (1-P)**N
  CDF = PDF
  IF (C .NE. 0) THEN
    P1 = P/(1-P)
    DO 50 K = 1,C
      PDF = PDF * (N-K+1) * P1/K
      CDF = CDF + PDF
50    CONTINUE
  ELSE
  END IF
  RETURN
  END
```

PROGRAM USED TO GENERATE TABLE H-1

```
      PROGRAM BARLOW (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE8,TAPE9)
      DIMENSION TIME(20,20), CONF(9),DURAB(8),CC(2),NN(9)
      REAL P,CDF,M,R
      INTEGER N,C,NN,CC

C     THIS PROGRAM GIVES A TABLE OF A SAMPLING PLAN FOR
C     THE MISSION TIME FOR IFRA DISTRIBUTIONS.
C     THIS IS DONE SIMPLY BY INPUTTING SAMPLE SIZE (N) AND
C     NUMBER OF FAILURES (C).

C     TIME      = A MULTIPLE OF TIME THAT WILL BE CALCULATED SO
C                 TIME MULTIPLIED BY DURABILITY CRITERION EQUALS
C                 TOTAL TEST TIME
C     CONF      = REQUIRED CONFIDENCE LEVEL
C     DURAB     = R = DURABILITY CRITERION
C     C         = NUMBER OF FAILURES
C     N         = SAMPLE SIZE

      DATA DURAB/.50,.60,.70,.75,.80,.85,.90,.95/
      DATA CONF/.50,.60,.70,.75,.80,.85,.90,.95,.99/
      DATA CC/0,1/
      DATA NN/2,3,4,5,6,7,8,9,10/


C     TITLE AND TABLE FORMAT.  DURABILITY AND CONFIDENCE LEVELS
C     ARE ON THE X AND Y AXES RESPECTIVELY.

      DO 70 KK = 1,2
        C = CC(KK)
        DO 80 LL = 1,9
          N = NN(LL)
      WRITE (9,120) N,C
  120 FORMAT ('1','TABLE II.  (CONT''D)',10X,'SAMPLING PLAN FOR',
     +' M FOR IFRA',
     +' DISTRIBUTIONS',//,38X,' NUMBER OF UNITS (N) = ',
     +I2,/,38X,' NUMBER OF FAILURES (C) = ',I1,//)
      WRITE (9,130)
  130 FORMAT (1X,98('-'))
      WRITE (9,140)
  140 FORMAT (' :',10X,':',31X,'DURABILITY',44X,':')
      WRITE (9,150)
  150 FORMAT (' :',10X,':',85X,':')
      WRITE (9,160) (DURAB(L),L=1,8)
  160 FORMAT (' :','  CONF.   ',':',5X,7(F3.2,7X),F3.2,7X,':')
      WRITE (9,150)
      WRITE (9,130)
      WRITE (9,150)
C
C
C     FOR EACH CONFIDENCE AND DURABILITY REQUIREMENT, TIME IS
C     CALCULATED (THAT IS THE MULTIPLE OF DURABILITY CRITERION
C     WHOSE PRODUCT IS TOTAL TIME).
```

```
      DO 10 I = 1,9
        CDF = CONF(I)
        K = 0

         DO 20 J = 1,8
           R = DURAB(J)
           K = K + 1
           CALL BINOM (CDF,N,R,C,M,K)
           IF ( M .LT. 1.0 ) THEN
              M = M * 10**8
           ELSE
           END IF
           TIME (I,J) = M
 20      CONTINUE
 10    CONTINUE

C      TABLE VALUES (TIME) PRINTED.

      I = I-1
      J = J-1
      DO 40 II = 1,I
        WRITE (9,200) CONF(II),(TIME(II,JJ),JJ=1,J)
200     FORMAT (' :',3X,F3.2,4X,':',3X,7(F6.3,4X),F6.3,6X,':')
        WRITE (9,150)
 40   CONTINUE
      WRITE (9,150)
      WRITE (9,210)
210   FORMAT (1X,98('-'))
      WRITE (9,220)
220   FORMAT (//' ******  = M < 1',
     +/' RECOMMENDATION:  1 < M < 3 ',/////)

 80   CONTINUE
 70   CONTINUE
      STOP
      END


C
C      CALCULATES M = TIME GIVEN CUMMULATIVE DIST'N FUNCTION,
C      SAMPLE SIZE (N), DURABILITY (R), AND # OF FAILURES (C).

      SUBROUTINE BINOM (CDF,N,R,C,M,K)
      REAL CDF,R,M,P,F,I,ALPHA,RO
      INTEGER C,N
      ALPHA = 1 - CDF
      XN = N
      IF (C .EQ. 0) THEN
         M = (ALOG(ALPHA))/ ( XN * ALOG(R))
      ELSE
        IF (C .EQ. 1) THEN
          IF (K .EQ. 1) THEN
```

```
          RO = 0
          I = .1
          RO = RO + I
50         TEST = RO**XN + XN * (1- RO) * RO**(XN-1)
          IF ( ABS(TEST - ALPHA) .LT. .000001 ) THEN
            GO TO 60
          ELSE
            IF ( TEST .LT. ALPHA) THEN
              RO = RO + I
            ELSE
              RO = RO - I
              I = I / 10.
              RO = RO + I
            END IF
          END IF
          GO TO 50
        ELSE
        END IF
      ELSE
      END IF
 60   CONTINUE
      M = (ALOG(RO)) / (ALOG(R))
    END IF

    RETURN
    END
```

APPENDIX F. TABLE F-1. SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

TABLE F-1. SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .95
NUMBER OF FAILURES (C) = 0

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	5	.97	6	.95	9	.96	14	.96	29	.95	59	.95
1.1	4	.95	6	.97	8	.96	13	.96	26	.95	54	.95
1.2	4	.96	5	.95	7	.95	12	.96	24	.95	49	.95
1.3	4	.97	5	.96	7	.96	11	.96	22	.95	45	.95
1.4	4	.98	5	.97	6	.95	10	.96	21	.95	42	.95
1.5	3	.96	4	.95	6	.96	9	.95	19	.95	39	.95
1.6	3	.96	4	.96	6	.97	9	.96	18	.95	37	.95
1.7	3	.97	4	.97	5	.95	8	.95	17	.95	35	.95
1.8	3	.98	4	.97	5	.96	8	.96	16	.95	33	.95
1.9	3	.98	4	.98	5	.97	8	.97	15	.95	31	.95
2.0	3	.98	3	.95	5	.97	7	.96	15	.96	30	.95
2.2	2	.95	3	.97	4	.96	7	.97	13	.95	27	.95
2.4	2	.96	3	.97	4	.97	6	.96	12	.95	25	.95
2.6	2	.97	3	.98	4	.98	6	.97	11	.95	23	.95
2.8	2	.98	3	.99	3	.95	5	.96	11	.96	21	.95
3.0	2	.98	2	.95	3	.96	5	.96	10	.96	20	.95

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .95
NUMBER OF FAILURES (C) = 1

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	8	.96	10	.95	14	.95	22	.95	46	.95	93	.95
1.1	7	.96	9	.95	13	.96	20	.95	42	.95	85	.95
1.2	7	.97	9	.97	12	.96	19	.96	39	.95	78	.95
1.3	6	.96	8	.96	11	.95	17	.95	36	.95	72	.95
1.4	6	.97	8	.97	11	.97	16	.95	33	.95	67	.95
1.5	6	.98	7	.96	10	.96	15	.95	31	.95	63	.95
1.6	5	.96	7	.97	9	.95	14	.95	29	.95	59	.95
1.7	5	.97	7	.98	9	.96	14	.96	27	.95	55	.95
1.8	5	.97	6	.96	8	.95	13	.96	26	.95	52	.95
1.9	5	.98	6	.97	8	.96	12	.95	25	.96	50	.95
2.0	5	.98	6	.97	8	.97	12	.96	24	.96	47	.95
2.2	4	.97	5	.96	7	.96	11	.96	21	.95	43	.95
2.4	4	.98	5	.97	7	.97	10	.96	20	.96	40	.95
2.6	4	.98	5	.98	6	.96	9	.96	18	.95	37	.95
2.8	4	.99	4	.96	6	.97	9	.97	17	.95	34	.95
3.0	3	.96	4	.97	6	.98	8	.96	16	.96	32	.95

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .95
NUMBER OF FAILURES (C) = 2

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	11	.97	14	.96	19	.95	30	.96	61	.95	124	.95
1.1	10	.97	13	.96	18	.96	27	.95	56	.95	113	.95
1.2	9	.96	12	.96	16	.95	25	.95	51	.95	104	.95
1.3	9	.97	11	.96	15	.96	23	.95	47	.95	96	.95
1.4	8	.96	10	.95	14	.96	22	.96	44	.95	89	.95
1.5	8	.97	10	.97	13	.95	20	.95	41	.95	83	.95
1.6	7	.96	9	.96	13	.97	19	.95	39	.95	78	.95
1.7	7	.97	9	.97	12	.96	18	.95	37	.96	74	.95
1.8	7	.98	8	.95	11	.95	17	.95	35	.96	70	.95
1.9	6	.95	8	.96	11	.96	16	.95	33	.95	66	.95
2.0	6	.96	8	.97	10	.95	16	.96	31	.95	63	.95
2.2	6	.98	7	.96	10	.97	14	.95	29	.96	57	.95
2.4	6	.99	7	.97	9	.96	13	.95	26	.95	53	.95
2.6	5	.97	6	.95	8	.95	12	.95	25	.96	49	.95
2.8	5	.98	6	.97	8	.97	12	.97	23	.96	45	.95
3.0	5	.98	6	.98	8	.98	11	.96	21	.95	42	.95

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .95
NUMBER OF FAILURES (C) = 3

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	13	.95	17	.95	24	.96	37	.96	76	.95	153	.95
1.1	12	.95	16	.96	22	.96	34	.96	69	.95	139	.95
1.2	11	.95	15	.96	20	.95	31	.95	63	.95	128	.95
1.3	11	.97	14	.96	19	.96	29	.96	59	.95	118	.95
1.4	10	.96	13	.96	18	.96	27	.96	55	.95	110	.95
1.5	10	.97	12	.96	17	.96	25	.95	51	.95	103	.95
1.6	9	.96	12	.97	16	.96	24	.96	48	.95	96	.95
1.7	9	.97	11	.96	15	.96	23	.96	45	.95	91	.95
1.8	8	.95	11	.97	14	.96	21	.95	43	.95	86	.95
1.9	8	.96	10	.96	14	.97	20	.95	41	.95	82	.95
2.0	8	.97	10	.97	13	.96	19	.95	39	.95	78	.95
2.2	7	.96	9	.96	12	.96	18	.96	35	.95	71	.95
2.4	7	.97	9	.98	11	.96	17	.96	33	.96	65	.95
2.6	7	.98	8	.97	11	.97	15	.95	30	.95	60	.95
2.8	6	.96	8	.98	10	.97	15	.97	28	.95	56	.95
3.0	6	.97	7	.96	9	.95	14	.96	27	.96	52	.95

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .95
NUMBER OF FAILURES (C) = 4

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	16	.96	21	.96	28	.95	44	.96	89	.95	181	.95
1.1	15	.97	19	.96	26	.96	40	.95	82	.95	165	.95
1.2	14	.97	18	.96	24	.96	37	.96	75	.95	151	.95
1.3	13	.96	16	.95	22	.95	34	.95	69	.95	140	.95
1.4	12	.96	15	.95	21	.96	32	.96	65	.95	130	.95
1.5	12	.97	15	.97	20	.96	30	.96	60	.95	121	.95
1.6	11	.96	14	.96	19	.96	28	.95	57	.95	114	.95
1.7	11	.98	13	.96	18	.96	27	.96	54	.95	107	.95
1.8	10	.96	13	.97	17	.96	25	.95	51	.95	102	.95
1.9	10	.97	12	.96	16	.96	24	.95	48	.95	96	.95
2.0	9	.95	12	.97	16	.97	23	.95	46	.95	92	.95
2.2	9	.97	11	.97	14	.95	21	.95	42	.95	84	.95
2.4	8	.95	10	.96	13	.95	20	.96	39	.96	77	.95
2.6	8	.97	10	.97	13	.97	18	.95	36	.95	71	.95
2.8	8	.98	9	.96	12	.97	17	.95	34	.96	66	.95
3.0	7	.95	9	.97	11	.95	16	.95	32	.96	62	.95

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .95
NUMBER OF FAILURES (C) = 5

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	18	.95	24	.96	33	.96	50	.95	103	.95	208	.95
1.1	17	.96	22	.96	30	.96	46	.95	94	.95	189	.95
1.2	16	.96	20	.95	28	.96	42	.95	86	.95	174	.95
1.3	15	.96	19	.96	26	.96	39	.95	80	.95	161	.95
1.4	14	.96	18	.96	24	.95	37	.96	74	.95	149	.95
1.5	13	.95	17	.96	23	.96	35	.96	70	.95	140	.95
1.6	13	.97	16	.96	22	.96	33	.96	65	.95	131	.95
1.7	12	.96	15	.95	21	.96	31	.96	62	.95	124	.95
1.8	12	.97	15	.97	20	.96	29	.95	58	.95	117	.95
1.9	11	.95	14	.96	19	.96	28	.96	56	.96	111	.95
2.0	11	.97	14	.97	18	.96	27	.96	53	.95	106	.95
2.2	10	.95	13	.97	17	.97	25	.96	48	.95	96	.95
2.4	10	.97	12	.97	16	.97	23	.96	45	.96	88	.95
2.6	9	.95	11	.96	15	.97	21	.95	41	.95	82	.95
2.8	9	.97	11	.97	14	.97	20	.96	39	.96	76	.95
3.0	9	.98	10	.96	13	.96	19	.96	36	.95	71	.95

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .95
NUMBER OF FAILURES (C) = 10

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	30	.95	39	.95	53	.95	82	.95	167	.95	336	.95
1.1	28	.95	36	.96	49	.95	75	.95	152	.95	306	.95
1.2	26	.95	34	.96	45	.95	69	.95	140	.95	281	.95
1.3	25	.96	32	.96	42	.95	64	.95	129	.95	260	.95
1.4	24	.97	30	.96	40	.96	60	.95	121	.95	242	.95
1.5	23	.97	28	.96	38	.96	56	.95	113	.95	226	.95
1.6	22	.97	27	.96	36	.96	53	.95	106	.95	212	.95
1.7	21	.97	26	.97	34	.96	50	.95	100	.95	200	.95
1.8	20	.96	25	.97	32	.95	48	.95	95	.95	189	.95
1.9	19	.96	24	.97	31	.96	46	.96	90	.95	180	.95
2.0	19	.97	23	.96	30	.96	44	.96	86	.95	171	.95
2.2	18	.97	21	.95	28	.96	40	.95	79	.95	156	.95
2.4	17	.97	20	.96	26	.96	38	.96	73	.95	143	.95
2.6	16	.96	19	.96	24	.95	35	.95	68	.96	133	.95
2.8	16	.98	18	.96	23	.96	33	.96	63	.95	124	.95
3.0	15	.97	18	.97	22	.96	31	.95	59	.95	116	.95

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .95
NUMBER OF FAILURES (C) = 25

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	65	.96	82	.95	112	.96	170	.95	345	.95	694	.95
1.1	60	.95	76	.95	103	.95	156	.95	314	.95	632	.95
1.2	56	.95	71	.95	95	.95	144	.95	289	.95	580	.95
1.3	53	.95	67	.96	89	.95	134	.95	268	.95	537	.95
1.4	51	.96	63	.95	84	.96	125	.95	250	.95	499	.95
1.5	48	.95	60	.96	79	.95	118	.95	234	.95	467	.95
1.6	46	.95	57	.95	75	.95	111	.95	220	.95	439	.95
1.7	45	.96	55	.96	72	.96	106	.95	208	.95	414	.95
1.8	43	.96	53	.96	69	.96	101	.96	197	.95	391	.95
1.9	42	.96	51	.96	66	.96	96	.95	188	.95	371	.95
2.0	41	.97	49	.96	63	.95	92	.95	179	.95	354	.95
2.2	39	.97	46	.96	59	.96	85	.95	164	.95	323	.95
2.4	37	.96	44	.96	55	.95	79	.95	152	.95	297	.95
2.6	36	.97	42	.97	52	.95	74	.95	141	.95	275	.95
2.8	34	.95	40	.96	50	.96	70	.95	132	.95	256	.95
3.0	33	.95	39	.97	48	.96	66	.95	124	.95	240	.95

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .90
NUMBER OF FAILURES (C) = 0

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	4	.94	5	.92	7	.92	11	.91	22	.90	45	.90
1.1	4	.95	5	.94	6	.91	10	.91	20	.90	41	.90
1.2	3	.92	4	.91	6	.92	9	.91	19	.91	38	.90
1.3	3	.93	4	.93	5	.90	8	.90	17	.90	35	.90
1.4	3	.95	4	.94	5	.92	8	.92	16	.91	33	.91
1.5	3	.96	4	.95	5	.93	7	.90	15	.91	30	.90
1.6	3	.96	3	.91	5	.94	7	.92	14	.91	29	.91
1.7	2	.91	3	.93	4	.91	7	.93	13	.90	27	.91
1.8	2	.92	3	.94	4	.92	6	.91	13	.92	25	.90
1.9	2	.93	3	.95	4	.93	6	.92	12	.91	24	.90
2.0	2	.94	3	.95	4	.94	6	.93	11	.90	23	.91
2.2	2	.95	3	.97	3	.91	5	.91	10	.90	21	.91
2.4	2	.96	2	.91	3	.92	5	.93	10	.92	19	.90
2.6	2	.97	2	.93	3	.94	4	.90	9	.92	18	.91
2.8	2	.98	2	.94	3	.95	4	.92	8	.91	17	.91
3.0	2	.98	2	.95	3	.96	4	.93	8	.92	15	.90

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .90
NUMBER OF FAILURES (C) = 1

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	7	.94	9	.93	12	.91	18	.90	38	.90	77	.90
1.1	6	.92	8	.92	11	.92	17	.91	35	.91	70	.90
1.2	6	.94	7	.91	10	.91	16	.92	32	.91	64	.90
1.3	5	.91	7	.93	9	.90	14	.90	29	.90	59	.90
1.4	5	.93	6	.90	9	.92	13	.90	27	.90	55	.90
1.5	5	.94	6	.92	8	.91	13	.92	26	.91	52	.91
1.6	5	.96	6	.94	8	.93	12	.92	24	.91	48	.90
1.7	4	.91	6	.95	7	.90	11	.91	23	.91	46	.91
1.8	4	.93	5	.91	7	.92	11	.92	22	.91	43	.90
1.9	4	.94	5	.93	7	.93	10	.91	20	.90	41	.90
2.0	4	.95	5	.94	7	.94	10	.92	19	.90	39	.90
2.2	4	.97	5	.96	6	.93	9	.92	18	.91	35	.90
2.4	3	.91	4	.92	6	.95	8	.91	16	.90	33	.91
2.6	3	.93	4	.94	5	.92	8	.93	15	.91	30	.90
2.8	3	.94	4	.96	5	.94	7	.91	14	.91	28	.90
3.0	3	.96	4	.97	5	.95	7	.93	13	.90	26	.90

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .90
NUMBER OF FAILURES (C) = 2

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	9	.91	12	.92	16	.90	25	.90	52	.90	105	.90
1.1	9	.94	11	.92	15	.91	23	.90	47	.90	96	.90
1.2	8	.92	10	.91	14	.91	21	.9C	44	.91	88	.90
1.3	8	.95	10	.93	13	.91	20	.91	40	.90	81	.90
1.4	7	.92	9	.92	12	.91	19	.92	38	.91	76	.90
1.5	7	.94	9	.94	12	.93	17	.90	35	.90	71	.90
1.6	6	.90	8	.92	11	.92	16	.90	33	.90	66	.90
1.7	6	.92	8	.94	10	.91	16	.92	31	.90	63	.91
1.8	6	.94	7	.90	10	.92	15	.92	30	.91	59	.90
1.9	6	.95	7	.92	9	.90	14	.91	28	.91	56	.90
2.0	6	.96	7	.94	9	.92	13	.90	27	.91	53	.90
2.2	5	.93	6	.91	8	.91	12	.90	24	.90	49	.91
2.4	5	.95	6	.93	8	.93	12	.93	23	.91	45	.91
2.6	5	.97	6	.95	7	.91	11	.93	21	.91	41	.90
2.8	5	.98	5	.91	7	.93	10	.92	2C	.92	39	.91
3.0	4	.92	5	.93	7	.95	10	.94	18	.90	36	.90

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .90
NUMBER OF FAILURES (C) = 3

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	12	.93	15	.91	21	.91	32	.91	65	.90	132	.90
1.1	11	.92	14	.92	19	.91	29	.90	60	.91	120	.90
1.2	10	.91	13	.92	18	.92	27	.91	55	.90	111	.90
1.3	10	.94	12	.91	17	.93	25	.91	51	.91	102	.90
1.4	9	.92	11	.90	15	.90	23	.90	47	.90	95	.90
1.5	9	.94	11	.93	15	.93	22	.91	44	.90	89	.90
1.6	8	.92	10	.91	14	.92	21	.91	42	.91	83	.90
1.7	8	.94	10	.93	13	.91	20	.92	39	.90	79	.90
1.8	8	.95	9	.90	13	.93	19	.92	37	.90	74	.90
1.9	7	.91	9	.92	12	.92	18	.92	35	.90	71	.91
2.0	7	.93	9	.94	12	.94	17	.91	34	.91	67	.90
2.2	7	.96	8	.92	11	.93	16	.92	31	.91	61	.90
2.4	6	.91	8	.95	10	.92	15	.93	28	.90	56	.90
2.6	6	.94	7	.91	9	.91	14	.93	26	.90	52	.90
2.8	6	.96	7	.94	9	.93	13	.92	25	.91	49	.91
3.0	6	.97	7	.96	8	.90	12	.91	23	.91	45	.90

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .90
NUMBER OF FAILURES (C) = 4

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	14	.91	18	.91	25	.91	38	.90	78	.90	158	.90
1.1	13	.91	17	.92	23	.91	35	.91	72	.91	144	.90
1.2	12	.91	16	.92	21	.90	32	.90	66	.91	132	.90
1.3	12	.94	15	.93	20	.92	30	.91	61	.90	122	.90
1.4	11	.92	14	.92	19	.92	28	.91	57	.91	114	.90
1.5	10	.90	13	.91	18	.92	26	.90	53	.90	106	.90
1.6	10	.93	13	.94	17	.92	25	.91	50	.91	100	.90
1.7	10	.95	12	.92	16	.92	24	.92	47	.90	94	.90
1.8	9	.92	11	.90	15	.91	23	.92	45	.91	89	.90
1.9	9	.94	11	.92	14	.90	21	.90	42	.90	85	.91
2.0	9	.95	11	.94	14	.92	21	.92	40	.90	80	.90
2.2	8	.93	10	.93	13	.92	19	.92	37	.91	73	.90
2.4	8	.95	9	.91	12	.92	18	.93	34	.90	67	.90
2.6	7	.91	9	.94	11	.91	16	.90	32	.91	62	.90
2.8	7	.93	8	.90	11	.93	15	.90	30	.91	58	.90
3.0	7	.95	8	.93	10	.91	15	.93	28	.91	54	.90

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .90
NUMBER OF FAILURES (C) = 5

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	17	.93	21	.90	29	.91	45	.91	91	.90	184	.90
1.1	15	.90	20	.92	27	.91	41	.91	83	.90	167	.90
1.2	14	.90	18	.90	25	.91	38	.91	76	.90	154	.90
1.3	14	.94	17	.91	23	.91	35	.91	71	.91	142	.90
1.4	13	.93	16	.91	22	.92	33	.91	66	.90	132	.90
1.5	12	.91	15	.90	21	.92	31	.91	62	.91	124	.90
1.6	12	.94	15	.93	19	.90	29	.91	58	.90	116	.90
1.7	11	.91	14	.92	19	.93	28	.92	55	.91	109	.90
1.8	11	.94	13	.90	18	.93	26	.91	52	.91	103	.90
1.9	11	.95	13	.93	17	.92	25	.91	49	.90	98	.90
2.0	10	.92	12	.90	16	.91	24	.91	47	.90	93	.90
2.2	10	.95	12	.94	15	.92	22	.91	43	.90	85	.90
2.4	9	.93	11	.93	14	.92	21	.93	40	.91	78	.90
2.6	9	.95	10	.90	13	.91	19	.91	37	.91	73	.91
2.8	8	.91	10	.93	13	.94	18	.91	35	.91	68	.91
3.0	8	.93	10	.96	12	.92	17	.91	32	.90	63	.90

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .90
NUMBER OF FAILURES (C) = 10

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	28	.91	36	.91	49	.91	75	.91	152	.90	306	.90
1.1	26	.91	33	.90	45	.91	68	.90	139	.90	279	.90
1.2	25	.93	31	.91	42	.91	63	.90	127	.90	256	.90
1.3	23	.91	29	.91	39	.91	59	.91	118	.90	237	.90
1.4	22	.92	28	.93	37	.92	55	.91	110	.90	220	.90
1.5	21	.92	26	.91	35	.92	52	.91	103	.90	206	.90
1.6	20	.91	25	.92	33	.91	49	.91	97	.90	193	.90
1.7	19	.90	24	.92	31	.90	46	.90	92	.91	182	.90
1.8	19	.93	23	.92	30	.91	44	.91	87	.90	172	.90
1.9	18	.92	22	.92	29	.92	42	.91	83	.91	164	.90
2.0	18	.94	21	.91	28	.92	40	.90	79	.91	156	.90
2.2	17	.94	20	.92	26	.92	37	.91	72	.90	142	.90
2.4	16	.93	19	.93	24	.91	35	.92	67	.91	131	.90
2.6	15	.91	18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.8	15	.95	17	.91	22	.93	31	.92	58	.91	113	.90
3.0	14	.91	17	.95	21	.93	29	.91	54	.90	106	.90

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .90
NUMBER OF FAILURES (C) = 25

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	62	.92	78	.91	105	.90	160	.90	324	.90	651	.90
1.1	57	.90	72	.90	97	.90	147	.91	295	.90	593	.90
1.2	54	.91	68	.92	90	.90	136	.91	272	.90	545	.90
1.3	51	.91	64	.92	84	.90	126	.90	252	.90	504	.90
1.4	49	.93	60	.91	79	.90	118	.90	235	.90	469	.90
1.5	46	.90	57	.91	75	.91	111	.90	220	.90	438	.90
1.6	45	.93	55	.92	71	.90	105	.90	207	.90	412	.90
1.7	43	.92	52	.91	68	.91	100	.91	196	.90	388	.90
1.8	42	.93	50	.91	65	.91	95	.90	186	.90	367	.90
1.9	40	.91	49	.93	63	.92	91	.91	177	.90	349	.90
2.0	39	.91	47	.92	60	.91	87	.90	169	.91	332	.90
2.2	37	.91	44	.91	56	.91	81	.91	155	.91	303	.90
2.4	36	.94	42	.92	53	.92	75	.91	143	.90	279	.90
2.6	34	.90	40	.92	50	.91	70	.90	133	.90	259	.90
2.8	33	.91	39	.94	48	.92	67	.92	124	.90	241	.90
3.0	32	.90	37	.92	46	.93	63	.91	117	.90	226	.90

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .80
NUMBER OF FAILURES (C) = 0

M *	DURABILITY .50 N	.50 TRUE C.L.	.60 N	.60 TRUE C.L.	.70 N	.70 TRUE C.L.	.80 N	.80 TRUE C.L.	.90 N	.90 TRUE C.L.	.95 N	.95 TRUE C.L.
1.0	3	.88	4	.87	5	.83	8	.83	16	.81	32	.81
1.1	3	.90	3	.81	5	.86	7	.82	14	.80	29	.81
1.2	2	.81	3	.84	4	.82	7	.85	13	.81	27	.81
1.3	2	.84	3	.86	4	.84	6	.82	12	.81	25	.81
1.4	2	.86	3	.88	4	.86	6	.85	11	.80	23	.81
1.5	2	.88	3	.90	4	.88	5	.81	11	.82	21	.80
1.6	2	.89	2	.80	3	.82	5	.83	10	.81	20	.81
1.7	2	.91	2	.82	3	.84	5	.85	9	.80	19	.81
1.8	2	.92	2	.84	3	.85	5	.87	9	.82	18	.81
1.9	2	.93	2	.86	3	.87	4	.82	9	.83	17	.81
2.0	2	.94	2	.87	3	.88	4	.83	8	.81	16	.81
2.2	2	.95	2	.89	3	.91	4	.86	7	.80	15	.82
2.4	1	.81	2	.91	2	.82	4	.88	7	.83	14	.82
2.6	1	.84	2	.93	2	.84	3	.82	6	.81	13	.82
2.8	1	.86	2	.94	2	.86	3	.85	6	.83	12	.82
3.0	1	.88	2	.95	2	.88	3	.87	6	.85	11	.82

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .80
NUMBER OF FAILURES (C) = 1

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	5	.81	7	.84	9	.80	14	.80	29	.80	59	.80
1.1	5	.85	6	.81	9	.84	13	.81	27	.81	54	.80
1.2	5	.88	6	.85	8	.83	12	.81	25	.81	50	.81
1.3	4	.81	6	.88	7	.80	11	.81	23	.81	46	.81
1.4	4	.84	5	.83	7	.83	11	.84	21	.80	43	.81
1.5	4	.87	5	.85	7	.86	10	.82	20	.81	40	.81
1.6	4	.89	5	.88	6	.82	9	.80	19	.82	37	.80
1.7	4	.91	5	.90	6	.84	9	.83	18	.82	35	.80
1.8	4	.93	4	.82	6	.86	8	.80	17	.82	33	.80
1.9	3	.82	4	.84	5	.80	8	.82	16	.82	32	.81
2.0	3	.84	4	.86	5	.82	8	.85	15	.81	30	.80
2.2	3	.88	4	.90	5	.86	7	.83	14	.82	28	.82
2.4	3	.91	4	.92	5	.89	7	.86	13	.82	25	.80
2.6	3	.93	3	.83	4	.83	6	.82	12	.82	23	.80
2.8	3	.94	3	.86	4	.86	6	.85	11	.81	22	.81
3.0	3	.96	3	.88	4	.88	6	.88	10	.80	20	.80

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .80
NUMBER OF FAILURES (C) = 2

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	8	.86	10	.83	14	.84	21	.82	42	.80	85	.80
1.1	7	.82	9	.82	12	.80	19	.82	38	.80	77	.80
1.2	7	.87	9	.86	12	.85	18	.83	35	.80	71	.80
1.3	6	.81	8	.84	11	.84	16	.81	33	.81	66	.81
1.4	6	.85	8	.87	10	.82	15	.81	31	.82	61	.80
1.5	6	.88	7	.83	10	.85	14	.81	29	.82	57	.80
1.6	6	.90	7	.86	9	.83	14	.84	27	.81	54	.81
1.7	5	.83	7	.88	9	.86	13	.83	25	.80	51	.81
1.8	5	.85	6	.82	8	.82	12	.81	24	.81	48	.81
1.9	5	.88	6	.85	8	.85	12	.84	23	.81	45	.80
2.0	5	.90	6	.87	8	.87	11	.82	22	.82	43	.80
2.2	5	.93	5	.80	7	.84	10	.81	20	.81	39	.80
2.4	4	.84	5	.85	7	.88	10	.86	18	.80	36	.80
2.6	4	.87	5	.88	6	.83	9	.84	17	.81	34	.81
2.8	4	.90	5	.91	6	.86	8	.80	16	.82	31	.80
3.0	4	.92	5	.93	6	.89	8	.84	15	.82	29	.80

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .80
NUMBER OF FAILURES (C) = 3

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	10	.83	13	.83	18	.84	27	.82	54	.80	110	.81
1.1	9	.81	12	.83	16	.82	25	.83	50	.81	100	.80
1.2	9	.86	11	.82	15	.82	23	.82	46	.81	92	.81
1.3	8	.82	10	.80	14	.82	21	.81	42	.80	85	.81
1.4	8	.86	10	.85	13	.82	20	.83	39	.80	79	.81
1.5	8	.89	9	.81	12	.80	19	.83	37	.81	74	.81
1.6	7	.83	9	.85	12	.84	18	.84	35	.81	69	.80
1.7	7	.86	9	.88	11	.82	17	.83	33	.81	65	.80
1.8	7	.89	8	.83	11	.85	16	.83	31	.81	62	.81
1.9	6	.80	8	.86	10	.82	15	.82	30	.82	59	.81
2.0	6	.83	8	.88	10	.84	14	.80	28	.81	56	.81
2.2	6	.88	7	.84	9	.82	13	.81	26	.82	51	.81
2.4	6	.91	7	.88	9	.87	12	.80	24	.82	47	.81
2.6	5	.81	6	.81	8	.83	12	.85	22	.81	43	.80
2.8	5	.85	6	.85	8	.87	11	.83	21	.82	40	.80
3.0	5	.88	6	.88	7	.81	10	.81	20	.83	38	.81

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .80
NUMBER OF FAILURES (C) = 4

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	12	.81	16	.83	21	.80	33	.82	66	.80	134	.80
1.1	12	.86	15	.85	20	.83	30	.81	61	.81	122	.80
1.2	11	.85	14	.85	18	.81	28	.82	56	.81	112	.80
1.3	10	.82	13	.84	17	.82	26	.82	52	.81	103	.80
1.4	10	.87	12	.83	16	.82	24	.81	48	.81	96	.80
1.5	9	.82	12	.87	15	.81	23	.83	45	.81	90	.80
1.6	9	.86	11	.84	14	.80	21	.80	42	.80	84	.80
1.7	9	.89	11	.87	14	.84	20	.81	40	.81	80	.81
1.8	8	.83	10	.84	13	.82	19	.81	38	.81	75	.80
1.9	8	.86	10	.87	13	.85	18	.80	36	.81	71	.80
2.0	8	.89	9	.81	12	.82	18	.83	34	.80	68	.80
2.2	7	.82	9	.87	11	.81	16	.81	32	.82	62	.80
2.4	7	.87	8	.82	11	.87	15	.82	29	.81	57	.80
2.6	7	.91	8	.86	10	.84	14	.81	27	.81	53	.81
2.8	7	.93	8	.90	10	.88	13	.80	25	.80	49	.80
3.0	6	.83	7	.82	9	.84	13	.85	24	.82	46	.80

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .80
NUMBER OF FAILURES (C) = 5

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	15	.85	19	.84	25	.81	39	.82	78	.80	157	.80
1.1	14	.85	17	.81	23	.81	35	.80	71	.80	143	.80
1.2	13	.85	16	.82	22	.83	33	.82	66	.81	131	.80
1.3	12	.83	15	.82	20	.81	30	.80	61	.81	122	.81
1.4	12	.88	14	.81	19	.82	28	.80	57	.81	113	.80
1.5	11	.85	14	.86	18	.82	27	.82	53	.81	106	.81
1.6	11	.88	13	.84	17	.82	25	.81	50	.81	99	.80
1.7	10	.84	12	.80	16	.81	24	.82	47	.80	94	.81
1.8	10	.87	12	.84	16	.85	23	.82	45	.81	89	.81
1.9	10	.90	12	.88	15	.83	22	.83	43	.82	84	.80
2.0	9	.83	11	.83	14	.81	21	.82	41	.82	80	.80
2.2	9	.89	10	.80	13	.81	19	.81	37	.81	73	.80
2.4	8	.82	10	.86	13	.87	18	.83	34	.80	67	.80
2.6	8	.87	9	.81	12	.85	17	.83	32	.81	62	.80
2.8	8	.91	9	.85	11	.82	16	.83	30	.82	58	.81
3.0	8	.93	9	.89	11	.86	15	.83	28	.81	54	.80

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .80
NUMBER OF FAILURES (C) = 10

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	26	.84	33	.83	44	.81	67	.81	135	.80	272	.80
1.1	24	.83	30	.81	41	.82	61	.80	123	.80	247	.80
1.2	23	.85	28	.81	38	.82	57	.82	114	.81	227	.80
1.3	21	.81	27	.84	35	.81	53	.81	105	.80	210	.80
1.4	20	.81	25	.82	33	.81	49	.80	98	.80	196	.80
1.5	19	.81	24	.83	31	.80	47	.82	92	.81	183	.80
1.6	19	.86	23	.84	30	.83	44	.81	87	.81	172	.80
1.7	18	.84	22	.84	28	.80	42	.82	82	.81	162	.80
1.8	17	.81	21	.83	27	.81	40	.82	78	.81	153	.80
1.9	17	.86	20	.81	26	.82	38	.81	74	.81	146	.81
2.0	16	.81	20	.86	25	.82	36	.80	70	.80	139	.81
2.2	16	.89	19	.87	24	.85	34	.83	65	.82	127	.81
2.4	15	.86	18	.87	22	.82	31	.80	60	.81	116	.80
2.6	14	.81	17	.86	21	.84	29	.80	56	.82	108	.81
2.8	14	.87	16	.84	20	.84	28	.83	52	.81	101	.81
3.0	14	.91	16	.89	19	.83	26	.80	49	.81	94	.80

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .80
NUMBER OF FAILURES (C) = 25

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	58	.82	73	.81	98	.80	149	.81	300	.81	601	.80
1.1	54	.82	68	.82	91	.82	136	.80	274	.81	548	.80
1.2	51	.82	63	.80	84	.80	126	.80	252	.80	503	.80
1.3	48	.81	60	.82	79	.81	118	.81	234	.81	466	.80
1.4	46	.82	57	.83	74	.80	110	.80	218	.81	433	.80
1.5	44	.82	54	.82	70	.80	104	.81	204	.80	405	.80
1.6	42	.81	52	.84	67	.81	98	.81	192	.80	381	.80
1.7	41	.84	49	.80	64	.82	93	.80	182	.81	359	.80
1.8	40	.85	48	.84	61	.81	89	.81	172	.80	340	.80
1.9	38	.80	46	.83	59	.82	85	.81	164	.80	323	.80
2.0	37	.81	45	.85	57	.83	81	.80	157	.81	307	.80
2.2	36	.86	42	.83	53	.82	75	.80	144	.81	281	.81
2.4	34	.82	40	.83	50	.82	70	.80	133	.81	258	.80
2.6	33	.83	38	.82	47	.81	66	.81	124	.81	239	.80
2.8	32	.83	37	.85	45	.82	63	.83	116	.81	223	.80
3.0	31	.82	36	.86	43	.81	59	.80	109	.81	209	.80

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .70
NUMBER OF FAILURES (C) = 0

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	2	.75	3	.78	4	.76	6	.74	12	.72	24	.71
1.1	2	.78	3	.81	4	.79	5	.71	11	.72	22	.71
1.2	2	.81	2	.71	3	.72	5	.74	10	.72	20	.71
1.3	2	.84	2	.74	3	.75	5	.77	9	.71	19	.72
1.4	2	.86	2	.76	3	.78	4	.71	9	.73	17	.71
1.5	2	.88	2	.78	3	.80	4	.74	8	.72	16	.71
1.6	2	.89	2	.80	3	.82	4	.76	8	.74	15	.71
1.7	2	.91	2	.82	2	.70	4	.78	7	.71	14	.71
1.8	1	.71	2	.84	2	.72	3	.70	7	.73	14	.73
1.9	1	.73	2	.86	2	.74	3	.72	7	.75	13	.72
2.0	1	.75	2	.87	2	.76	3	.74	6	.72	12	.71
2.2	1	.78	2	.89	2	.79	3	.77	6	.75	11	.71
2.4	1	.81	1	.71	2	.82	3	.8C	5	.72	10	.71
2.6	1	.84	1	.74	2	.84	3	.82	5	.75	10	.74
2.8	1	.86	1	.76	2	.86	2	.71	5	.77	9	.73
3.0	1	.88	1	.78	2	.88	2	.74	4	.72	8	.71

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .70
NUMBER OF FAILURES (C) = 1

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	5	.81	6	.77	8	.74	12	.73	24	.71	49	.71
1.1	4	.74	5	.71	7	.72	11	.73	22	.71	44	.70
1.2	4	.78	5	.76	7	.76	10	.72	20	.71	41	.71
1.3	4	.81	5	.79	6	.72	9	.70	19	.72	38	.71
1.4	4	.84	4	.70	6	.76	9	.74	18	.73	35	.71
1.5	3	.71	4	.74	6	.79	8	.71	16	.70	33	.71
1.6	3	.75	4	.77	5	.72	8	.75	15	.70	31	.71
1.7	3	.77	4	.80	5	.75	7	.70	15	.73	29	.71
1.8	3	.80	4	.82	5	.78	7	.73	14	.72	27	.70
1.9	3	.82	4	.84	5	.80	7	.76	13	.71	26	.71
2.0	3	.84	3	.70	4	.70	7	.78	13	.74	25	.72
2.2	3	.88	3	.75	4	.75	6	.75	12	.74	23	.72
2.4	3	.91	3	.79	4	.79	6	.79	11	.74	21	.72
2.6	3	.93	3	.83	4	.83	5	.73	10	.73	19	.71
2.8	2	.73	3	.86	4	.86	5	.77	9	.71	18	.72
3.0	2	.77	3	.88	3	.73	5	.80	9	.75	17	.72

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .70
NUMBER OF FAILURES (C) = 2

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	7	.77	9	.77	12	.75	18	.73	36	.71	72	.70
1.1	6	.72	8	.74	11	.75	16	.71	33	.72	66	.71
1.2	6	.77	8	.79	10	.73	15	.72	30	.71	60	.70
1.3	6	.81	7	.75	9	.71	14	.72	28	.71	56	.71
1.4	5	.72	7	.79	9	.75	13	.72	26	.71	52	.71
1.5	5	.76	6	.72	8	.71	12	.71	24	.70	49	.71
1.6	5	.80	6	.76	8	.75	12	.75	23	.72	46	.71
1.7	5	.83	6	.79	8	.79	11	.73	22	.72	43	.71
1.8	5	.85	6	.82	7	.73	11	.76	21	.73	41	.71
1.9	4	.71	5	.72	7	.76	10	.73	20	.73	39	.71
2.0	4	.74	5	.75	7	.79	10	.76	19	.73	37	.71
2.2	4	.79	5	.80	6	.73	9	.74	17	.71	34	.72
2.4	4	.84	5	.85	6	.78	8	.71	16	.73	31	.71
2.6	4	.87	4	.71	6	.83	8	.76	15	.73	29	.72
2.8	4	.90	4	.76	5	.74	7	.71	14	.73	27	.72
3.0	4	.92	4	.79	5	.78	7	.75	13	.73	25	.71

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .70
NUMBER OF FAILURES (C) = 3

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	9	.75	11	.70	15	.70	23	.70	47	.70	95	.71
1.1	8	.71	11	.77	14	.72	21	.70	43	.71	86	.70
1.2	8	.77	10	.75	13	.72	20	.73	40	.72	79	.70
1.3	8	.82	9	.72	12	.71	18	.70	37	.71	73	.70
1.4	7	.75	9	.77	12	.76	17	.71	34	.70	68	.70
1.5	7	.79	8	.71	11	.74	16	.71	32	.71	64	.71
1.6	7	.83	8	.76	10	.70	15	.70	30	.71	60	.71
1.7	6	.73	8	.79	10	.74	15	.75	29	.72	57	.71
1.8	6	.77	7	.71	10	.78	14	.73	27	.71	54	.71
1.9	6	.80	7	.75	9	.73	13	.71	26	.72	51	.71
2.0	6	.83	7	.78	9	.77	13	.75	25	.73	48	.70
2.2	5	.70	7	.84	8	.73	12	.75	23	.73	44	.70
2.4	5	.76	6	.76	8	.79	11	.74	21	.72	41	.71
2.6	5	.81	6	.81	7	.72	10	.71	19	.70	38	.72
2.8	5	.85	6	.85	7	.77	10	.76	18	.71	35	.71
3.0	5	.88	5	.70	7	.81	9	.72	17	.72	33	.71

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .70
NUMBER OF FAILURES (C) = 4

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	11	.73	14	.72	19	.72	29	.72	58	.70	117	.70
1.1	10	.70	13	.73	18	.74	27	.73	53	.70	107	.70
1.2	10	.77	12	.72	16	.71	25	.73	49	.71	98	.70
1.3	9	.72	12	.78	15	.71	23	.72	46	.72	91	.71
1.4	9	.78	11	.75	14	.70	21	.70	42	.70	85	.71
1.5	9	.82	10	.71	14	.76	20	.71	40	.71	79	.70
1.6	8	.75	10	.76	13	.74	19	.72	37	.70	74	.70
1.7	8	.79	10	.80	12	.71	18	.72	35	.70	70	.71
1.8	8	.83	9	.74	12	.75	17	.71	34	.72	66	.70
1.9	7	.72	9	.78	11	.71	17	.75	32	.71	63	.71
2.0	7	.76	9	.81	11	.75	16	.74	31	.73	60	.71
2.2	7	.82	8	.76	10	.72	15	.75	28	.72	55	.71
2.4	7	.87	8	.82	10	.79	14	.76	26	.72	50	.70
2.6	6	.74	7	.72	9	.74	13	.75	24	.72	47	.71
2.8	6	.79	7	.78	9	.80	12	.73	23	.74	44	.72
3.0	6	.83	7	.82	8	.72	12	.78	21	.71	41	.71

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .70
NUMBER OF FAILURES (C) = 5

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	13	.71	17	.74	23	.73	34	.70	70	.71	140	.71
1.1	13	.79	16	.75	21	.72	32	.73	63	.70	127	.70
1.2	12	.77	15	.76	20	.75	29	.71	58	.70	117	.71
1.3	11	.74	14	.75	18	.71	27	.71	54	.71	108	.70
1.4	11	.80	13	.74	17	.72	26	.74	51	.72	101	.71
1.5	10	.74	12	.70	16	.71	24	.72	47	.70	94	.70
1.6	10	.79	12	.76	16	.77	23	.73	45	.72	88	.70
1.7	9	.71	11	.71	15	.75	22	.74	42	.71	83	.70
1.8	9	.76	11	.76	14	.73	21	.74	40	.71	79	.71
1.9	9	.80	11	.80	14	.77	20	.74	38	.71	75	.71
2.0	9	.83	10	.73	13	.73	19	.73	36	.70	71	.70
2.2	8	.76	10	.80	12	.72	17	.70	33	.71	65	.71
2.4	8	.82	9	.74	12	.79	16	.71	31	.72	60	.71
2.6	8	.87	9	.81	11	.76	15	.71	29	.73	56	.72
2.8	7	.73	8	.71	10	.71	14	.70	27	.72	52	.71
3.0	7	.79	8	.76	10	.77	14	.76	25	.71	49	.72

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .70
NUMBER OF FAILURES (C) = 10

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	24	.73	30	.71	41	.73	62	.72	124	.71	249	.70
1.1	22	.70	28	.72	38	.73	57	.72	113	.70	227	.71
1.2	21	.73	26	.71	35	.72	52	.71	104	.70	208	.70
1.3	20	.74	25	.74	33	.73	49	.72	97	.71	193	.71
1.4	19	.73	24	.76	31	.73	46	.72	90	.70	179	.70
1.5	18	.72	22	.71	29	.71	43	.72	85	.71	168	.71
1.6	18	.79	21	.71	28	.74	41	.73	80	.71	158	.71
1.7	17	.75	21	.77	27	.75	39	.73	75	.70	149	.71
1.8	16	.70	20	.76	25	.70	37	.72	71	.70	141	.71
1.9	16	.76	19	.73	24	.70	35	.71	68	.71	134	.71
2.0	16	.81	19	.79	24	.76	34	.73	65	.71	127	.70
2.2	15	.79	17	.70	22	.74	31	.71	59	.70	116	.70
2.4	14	.73	17	.79	21	.76	29	.71	55	.71	107	.71
2.6	14	.81	16	.77	20	.77	27	.70	51	.71	99	.70
2.8	13	.72	15	.72	19	.77	26	.73	48	.71	92	.70
3.0	13	.78	15	.79	18	.75	25	.75	45	.71	87	.71

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .70
NUMBER OF FAILURES (C) = 25

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	55	.70	70	.73	93	.70	141	.71	283	.70	567	.70
1.1	52	.73	65	.73	86	.71	129	.70	258	.70	517	.70
1.2	49	.74	61	.74	80	.71	120	.71	238	.70	475	.70
1.3	46	.71	57	.72	75	.71	112	.72	221	.71	439	.70
1.4	44	.72	54	.72	71	.72	105	.72	206	.71	409	.70
1.5	42	.71	52	.74	67	.71	99	.72	193	.70	382	.70
1.6	41	.75	49	.70	64	.72	93	.70	182	.71	359	.70
1.7	39	.70	47	.70	61	.72	89	.72	172	.71	339	.70
1.8	38	.72	46	.74	59	.74	85	.72	163	.70	321	.70
1.9	37	.73	44	.72	56	.71	81	.72	155	.70	305	.70
2.0	36	.73	43	.74	54	.71	78	.73	148	.70	290	.70
2.2	35	.78	41	.77	51	.74	72	.72	136	.71	265	.70
2.4	33	.72	39	.77	48	.73	67	.71	126	.71	244	.70
2.6	32	.73	37	.74	45	.70	63	.71	117	.70	226	.70
2.8	31	.72	36	.77	43	.70	60	.73	110	.71	211	.70
3.0	31	.82	35	.79	42	.75	57	.73	104	.72	198	.71

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .60
NUMBER OF FAILURES (C) = 0

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	2	.75	2	.64	3	.66	5	.67	9	.61	18	.60
1.1	2	.78	2	.67	3	.69	4	.63	8	.60	17	.62
1.2	2	.81	2	.71	3	.72	4	.66	8	.64	15	.60
1.3	2	.84	2	.74	2	.60	4	.69	7	.62	14	.61
1.4	1	.62	2	.76	2	.63	3	.61	7	.64	13	.61
1.5	1	.65	2	.78	2	.66	3	.63	6	.61	12	.60
1.6	1	.67	2	.80	2	.68	3	.66	6	.64	12	.63
1.7	1	.69	2	.82	2	.70	3	.68	6	.66	11	.62
1.8	1	.71	1	.60	2	.72	3	.70	5	.61	10	.60
1.9	1	.73	1	.62	2	.74	3	.72	5	.63	10	.62
2.0	1	.75	1	.64	2	.76	3	.74	5	.65	9	.60
2.2	1	.78	1	.67	2	.79	2	.63	4	.60	9	.64
2.4	1	.81	1	.71	2	.82	2	.66	4	.64	8	.63
2.6	1	.84	1	.74	1	.60	2	.69	4	.67	7	.61
2.8	1	.86	1	.76	1	.63	2	.71	4	.69	7	.63
3.0	1	.88	1	.78	1	.66	2	.74	3	.61	6	.60

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .60
NUMBER OF FAILURES (C) = 1

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	4	.69	5	.66	7	.67	10	.62	20	.61	40	.60
1.1	4	.74	5	.71	6	.63	9	.62	18	.60	37	.61
1.2	4	.78	4	.62	6	.68	9	.66	17	.62	34	.61
1.3	3	.64	4	.67	5	.61	8	.64	16	.63	31	.60
1.4	3	.68	4	.70	5	.65	8	.68	15	.63	29	.61
1.5	3	.71	4	.74	5	.69	7	.64	14	.63	27	.60
1.6	3	.75	4	.77	5	.72	7	.67	13	.62	26	.62
1.7	3	.77	3	.62	4	.62	6	.61	12	.61	24	.61
1.8	3	.80	3	.65	4	.65	6	.64	12	.64	23	.61
1.9	3	.82	3	.68	4	.68	6	.67	11	.62	22	.62
2.0	3	.84	3	.70	4	.70	6	.70	11	.65	21	.62
2.2	2	.61	3	.75	4	.75	5	.64	10	.64	19	.62
2.4	2	.66	3	.79	3	.61	5	.69	9	.63	17	.60
2.6	2	.70	3	.83	3	.65	5	.73	8	.61	16	.61
2.8	2	.73	3	.86	3	.69	4	.63	8	.65	15	.62
3.0	2	.77	2	.61	3	.73	4	.67	7	.61	14	.61

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .60
NUMBER OF FAILURES (C) = 2

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	6	.66	8	.68	10	.62	15	.60	31	.61	62	.60
1.1	6	.72	7	.64	9	.60	14	.62	28	.60	57	.61
1.2	5	.62	7	.70	9	.66	13	.62	26	.61	52	.61
1.3	5	.67	6	.63	8	.62	12	.61	24	.61	48	.61
1.4	5	.72	6	.68	8	.67	11	.60	23	.63	45	.61
1.5	5	.76	6	.72	7	.61	11	.65	21	.61	42	.61
1.6	5	.80	5	.61	7	.65	10	.62	20	.62	39	.60
1.7	4	.64	5	.65	7	.69	10	.66	19	.62	37	.61
1.8	4	.67	5	.68	6	.61	9	.62	18	.62	35	.61
1.9	4	.71	5	.72	6	.64	9	.65	17	.62	33	.60
2.0	4	.74	5	.75	6	.67	9	.69	16	.61	32	.62
2.2	4	.79	4	.61	6	.73	8	.66	15	.63	29	.61
2.4	4	.84	4	.66	5	.64	7	.61	14	.64	27	.62
2.6	4	.87	4	.71	5	.69	7	.66	13	.64	25	.62
2.8	3	.63	4	.76	5	.74	7	.71	12	.63	23	.61
3.0	3	.67	4	.79	5	.78	6	.63	11	.61	22	.63

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .60
NUMBER OF FAILURES (C) = 3

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	8	.64	10	.62	14	.64	21	.63	42	.62	83	.60
1.1	8	.71	10	.69	13	.65	19	.62	38	.61	76	.61
1.2	7	.64	9	.66	12	.65	18	.64	35	.61	70	.61
1.3	7	.70	8	.60	11	.63	16	.60	33	.62	65	.61
1.4	7	.75	8	.66	10	.60	15	.60	30	.60	60	.60
1.5	6	.64	8	.71	10	.65	15	.66	28	.60	56	.60
1.6	6	.69	7	.63	9	.60	14	.65	27	.62	53	.61
1.7	6	.73	7	.67	9	.65	13	.63	25	.60	50	.61
1.8	6	.77	7	.71	9	.69	13	.67	24	.62	47	.60
1.9	6	.80	7	.75	8	.62	12	.64	23	.62	45	.61
2.0	5	.63	6	.63	8	.66	11	.60	22	.62	43	.61
2.2	5	.70	6	.70	8	.73	11	.67	20	.62	39	.61
2.4	5	.76	6	.76	7	.66	10	.65	19	.64	36	.61
2.6	5	.81	5	.60	7	.72	9	.62	17	.61	33	.60
2.8	5	.85	5	.66	6	.61	9	.67	16	.61	31	.61
3.0	5	.88	5	.70	6	.66	8	.61	15	.61	29	.61

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .60
NUMBER OF FAILURES (C) = 4

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	10	.62	13	.65	17	.61	26	.62	52	.60	105	.61
1.1	10	.70	12	.64	16	.63	24	.62	48	.61	95	.60
1.2	9	.66	11	.62	15	.64	22	.62	44	.61	88	.61
1.3	9	.72	11	.69	14	.64	21	.64	41	.62	81	.60
1.4	8	.64	10	.65	13	.63	19	.61	38	.61	75	.60
1.5	8	.70	10	.71	12	.60	18	.61	36	.62	71	.61
1.6	8	.75	9	.64	12	.66	17	.61	34	.62	66	.60
1.7	7	.63	9	.69	11	.62	16	.60	32	.62	63	.61
1.8	7	.68	9	.74	11	.66	16	.65	30	.61	59	.60
1.9	7	.72	8	.64	10	.60	15	.63	29	.63	56	.60
2.0	7	.76	8	.68	10	.65	14	.61	27	.60	54	.62
2.2	6	.61	8	.76	9	.61	13	.61	25	.61	49	.61
2.4	6	.68	7	.66	9	.68	12	.60	23	.61	45	.61
2.6	6	.74	7	.72	8	.60	12	.67	22	.64	42	.62
2.8	6	.79	7	.78	8	.67	11	.64	20	.61	39	.61
3.0	6	.83	6	.62	8	.72	11	.70	19	.62	37	.62

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .60
NUMBER OF FAILURES (C) = 5

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	12	.61	16	.67	21	.64	31	.61	63	.61	126	.61
1.1	12	.70	14	.60	19	.62	29	.63	57	.60	115	.61
1.2	11	.67	14	.69	18	.64	27	.64	53	.61	105	.60
1.3	10	.62	13	.67	17	.65	25	.63	49	.61	97	.60
1.4	10	.68	12	.64	16	.65	23	.61	46	.62	91	.61
1.5	10	.74	12	.70	15	.64	22	.63	43	.61	85	.61
1.6	9	.66	11	.65	14	.62	21	.64	40	.60	80	.61
1.7	9	.71	11	.71	14	.68	20	.64	38	.61	75	.60
1.8	9	.76	10	.64	13	.64	19	.64	36	.61	71	.60
1.9	8	.63	10	.69	13	.69	18	.63	35	.63	68	.61
2.0	8	.68	10	.73	12	.64	17	.61	33	.62	64	.60
2.2	8	.76	9	.67	11	.62	16	.63	30	.61	59	.61
2.4	7	.61	9	.74	11	.70	15	.64	28	.62	54	.61
2.6	7	.67	8	.64	10	.64	14	.63	26	.62	50	.61
2.8	7	.73	8	.71	10	.71	13	.61	24	.60	47	.61
3.0	7	.79	8	.76	9	.63	13	.68	23	.62	44	.61

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .60
NUMBER OF FAILURES (C) = 10

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	23	.66	28	.60	38	.62	57	.61	115	.61	230	.60
1.1	21	.62	26	.60	35	.61	53	.62	105	.61	210	.61
1.2	20	.64	25	.65	33	.63	49	.62	97	.61	193	.61
1.3	19	.65	23	.61	31	.64	45	.60	90	.61	178	.60
1.4	18	.64	22	.62	29	.63	43	.63	84	.61	166	.60
1.5	17	.61	21	.63	27	.60	40	.61	78	.60	155	.60
1.6	17	.69	20	.62	26	.62	38	.62	74	.61	146	.61
1.7	16	.63	19	.60	25	.63	36	.61	70	.61	138	.61
1.8	16	.70	19	.67	24	.64	35	.64	66	.60	130	.60
1.9	15	.63	18	.64	23	.63	33	.62	63	.61	124	.61
2.0	15	.69	18	.70	22	.62	32	.64	60	.60	118	.61
2.2	14	.64	17	.70	21	.66	29	.61	55	.60	108	.61
2.4	14	.73	16	.68	20	.68	27	.60	51	.61	99	.60
2.6	13	.63	15	.64	19	.68	26	.64	48	.62	92	.61
2.8	13	.72	15	.72	18	.67	24	.60	45	.62	86	.61
3.0	13	.78	14	.64	17	.64	23	.62	42	.61	80	.60

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .60
NUMBER OF FAILURES (C) = 25

M *	DURABILITY .50 N	.50 TRUE C.L.	.60 N	.60 TRUE C.L.	.70 N	.70 TRUE C.L.	.80 N	.80 TRUE C.L.	.90 N	.90 TRUE C.L.	.95 N	.95 TRUE C.L.
1.0	53	.61	67	.62	89	.60	134	.60	269	.60	539	.60
1.1	50	.63	62	.61	83	.63	123	.60	246	.60	491	.60
1.2	47	.62	58	.61	77	.62	114	.60	227	.61	451	.60
1.3	45	.65	55	.63	72	.61	107	.62	210	.60	418	.60
1.4	43	.65	52	.62	68	.62	100	.61	196	.60	389	.60
1.5	41	.63	50	.64	65	.64	94	.61	184	.61	364	.60
1.6	40	.67	48	.65	61	.60	89	.61	173	.60	342	.60
1.7	38	.62	46	.64	59	.63	85	.62	164	.61	322	.60
1.8	37	.63	44	.62	56	.61	81	.62	156	.61	305	.60
1.9	36	.64	43	.65	54	.62	77	.60	148	.61	290	.60
2.0	35	.63	41	.60	52	.61	74	.60	141	.60	276	.60
2.2	34	.69	39	.62	49	.63	69	.62	130	.61	252	.60
2.4	33	.72	37	.60	46	.61	64	.60	120	.61	232	.60
2.6	32	.73	36	.65	44	.64	61	.63	112	.61	216	.61
2.8	31	.72	35	.68	42	.63	57	.60	105	.61	201	.60
3.0	30	.68	34	.70	40	.61	55	.64	99	.61	189	.61

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .50
NUMBER OF FAILURES (C) = 0

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	1	.50	2	.64	2	.51	4	.59	7	.52	14	.51
1.1	1	.53	2	.67	2	.54	3	.52	6	.50	13	.52
1.2	1	.56	2	.71	2	.58	3	.55	6	.53	12	.52
1.3	1	.59	2	.74	2	.60	3	.58	6	.56	11	.52
1.4	1	.62	1	.51	2	.63	3	.61	5	.52	10	.51
1.5	1	.65	1	.54	2	.66	3	.63	5	.55	10	.54
1.6	1	.67	1	.56	2	.68	2	.51	5	.57	9	.52
1.7	1	.69	1	.58	2	.70	2	.53	4	.51	8	.50
1.8	1	.71	1	.60	2	.72	2	.55	4	.53	8	.52
1.9	1	.73	1	.62	2	.74	2	.57	4	.55	8	.54
2.0	1	.75	1	.64	1	.51	2	.59	4	.57	7	.51
2.2	1	.78	1	.67	1	.54	2	.63	3	.50	7	.55
2.4	1	.81	1	.71	1	.58	2	.66	3	.53	6	.52
2.6	1	.84	1	.74	1	.60	2	.69	3	.56	6	.55
2.8	1	.86	1	.76	1	.63	2	.71	3	.59	5	.51
3.0	1	.88	1	.78	1	.66	2	.74	3	.61	5	.54

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .50
NUMBER OF FAILURES (C) = 1

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	3	.50	4	.52	6	.58	9	.56	17	.52	34	.51
1.1	3	.55	4	.58	5	.52	8	.55	15	.50	31	.51
1.2	3	.60	4	.62	5	.57	7	.52	14	.51	28	.50
1.3	3	.64	4	.67	5	.61	7	.56	13	.51	26	.51
1.4	3	.68	3	.52	4	.51	6	.51	12	.50	24	.50
1.5	3	.71	3	.55	4	.55	6	.55	12	.54	23	.52
1.6	3	.75	3	.59	4	.58	6	.58	11	.53	21	.50
1.7	3	.77	3	.62	4	.62	5	.50	10	.51	20	.51
1.8	2	.51	3	.65	4	.65	5	.53	10	.54	19	.51
1.9	2	.54	3	.68	4	.68	5	.56	9	.51	18	.51
2.0	2	.56	3	.70	3	.51	5	.59	9	.53	17	.50
2.2	2	.61	3	.75	3	.57	4	.50	8	.52	16	.52
2.4	2	.66	3	.79	3	.61	4	.55	8	.56	15	.53
2.6	2	.70	2	.54	3	.65	4	.59	7	.53	14	.54
2.8	2	.73	2	.58	3	.69	4	.63	7	.57	13	.54
3.0	2	.77	2	.61	3	.73	4	.67	6	.52	12	.53

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .50
NUMBER OF FAILURES (C) = 2

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	5	.50	7	.58	9	.54	14	.55	27	.52	54	.51
1.1	5	.56	6	.52	8	.51	12	.50	25	.53	49	.51
1.2	5	.62	6	.58	8	.57	12	.56	23	.53	45	.51
1.3	5	.67	6	.63	7	.52	11	.55	21	.52	42	.51
1.4	4	.51	5	.52	7	.56	10	.53	20	.53	39	.51
1.5	4	.56	5	.57	7	.61	10	.57	18	.50	36	.50
1.6	4	.60	5	.61	6	.53	9	.54	17	.50	34	.51
1.7	4	.64	5	.65	6	.57	9	.58	16	.50	32	.51
1.8	4	.67	5	.68	6	.61	8	.53	16	.54	30	.50
1.9	4	.71	4	.51	6	.64	8	.56	15	.53	29	.51
2.0	4	.74	4	.55	5	.52	8	.60	14	.51	28	.52
2.2	4	.79	4	.61	5	.58	7	.55	13	.52	25	.51
2.4	3	.53	4	.66	5	.64	7	.61	12	.52	23	.51
2.6	3	.58	4	.71	5	.69	6	.54	11	.51	22	.53
2.8	3	.63	4	.76	4	.53	6	.59	11	.56	20	.51
3.0	3	.67	4	.79	4	.58	6	.63	10	.54	19	.52

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .50
NUMBER OF FAILURES (C) = 3

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	7	.50	9	.52	12	.51	19	.54	37	.51	74	.51
1.1	7	.57	9	.59	11	.50	17	.52	34	.52	67	.50
1.2	7	.64	8	.54	11	.57	16	.54	31	.51	62	.51
1.3	6	.53	8	.60	10	.54	15	.55	29	.52	57	.51
1.4	6	.59	7	.52	10	.60	14	.54	27	.52	53	.51
1.5	6	.64	7	.58	9	.55	13	.53	25	.51	50	.51
1.6	6	.69	7	.63	9	.60	12	.51	24	.52	47	.51
1.7	5	.51	6	.50	8	.53	12	.56	23	.54	44	.51
1.8	5	.55	6	.55	8	.58	11	.52	21	.50	42	.51
1.9	5	.60	6	.59	8	.62	11	.56	20	.50	40	.52
2.0	5	.63	6	.63	7	.52	10	.51	19	.50	38	.51
2.2	5	.70	6	.70	7	.59	10	.59	18	.53	35	.52
2.4	5	.76	5	.54	7	.66	9	.55	17	.55	32	.52
2.6	5	.81	5	.60	6	.55	8	.50	15	.50	30	.53
2.8	4	.54	5	.66	6	.61	8	.56	15	.56	28	.53
3.0	4	.59	5	.70	6	.66	8	.61	14	.55	26	.52

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .50
NUMBER OF FAILURES (C) = 4

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	9	.50	12	.56	16	.55	24	.54	47	.51	94	.51
1.1	9	.58	11	.55	15	.57	22	.54	43	.51	85	.50
1.2	8	.51	10	.52	14	.57	20	.52	39	.50	78	.50
1.3	8	.58	10	.59	13	.56	19	.54	37	.52	73	.51
1.4	8	.64	9	.53	12	.54	18	.55	34	.51	68	.51
1.5	7	.52	9	.59	11	.51	17	.56	32	.51	63	.50
1.6	7	.58	9	.64	11	.56	16	.55	30	.51	59	.50
1.7	7	.63	8	.55	10	.51	15	.54	29	.53	56	.51
1.8	7	.68	8	.60	10	.56	14	.52	27	.51	53	.51
1.9	7	.72	8	.64	10	.60	14	.56	26	.52	50	.50
2.0	6	.53	7	.51	9	.52	13	.53	25	.53	48	.51
2.2	6	.61	7	.59	9	.61	12	.53	23	.53	44	.51
2.4	6	.68	7	.66	8	.54	11	.51	21	.52	40	.50
2.6	6	.74	7	.72	8	.60	11	.58	20	.54	38	.52
2.8	6	.79	6	.56	8	.67	10	.53	18	.50	35	.51
3.0	5	.51	6	.62	7	.55	10	.59	17	.51	33	.52

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .50
NUMBER OF FAILURES (C) = 5

M *	DURABILITY .50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	11	.50	14	.51	19	.53	29	.54	57	.51	114	.51
1.1	11	.59	13	.51	18	.56	26	.51	52	.51	104	.51
1.2	10	.54	13	.60	16	.50	24	.51	48	.51	95	.50
1.3	10	.62	12	.57	15	.50	23	.54	44	.50	88	.50
1.4	9	.54	11	.53	15	.58	21	.51	42	.52	82	.51
1.5	9	.60	11	.59	14	.56	20	.52	39	.51	77	.51
1.6	9	.66	10	.53	13	.53	19	.53	37	.52	72	.51
1.7	8	.53	10	.58	13	.59	18	.52	35	.52	68	.51
1.8	8	.58	10	.64	12	.54	17	.51	33	.52	64	.50
1.9	8	.63	9	.54	12	.59	17	.57	31	.50	61	.50
2.0	8	.68	9	.58	11	.53	16	.54	30	.52	58	.50
2.2	7	.53	9	.67	11	.62	15	.56	28	.54	53	.50
2.4	7	.61	8	.57	10	.57	14	.56	26	.54	49	.51
2.6	7	.67	8	.64	10	.64	13	.54	24	.53	46	.52
2.8	7	.73	8	.71	9	.56	12	.51	22	.51	43	.52
3.0	7	.79	7	.53	9	.63	12	.58	21	.52	40	.51

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .50
NUMBER OF FAILURES (C) = 10

M *	DURABILITY											
	.50		.60		.70		.80		.90		.95	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.0	21	.50	27	.54	36	.53	54	.53	107	.51	214	.51
1.1	20	.53	25	.54	33	.52	49	.51	98	.51	195	.51
1.2	19	.55	23	.50	31	.54	46	.53	90	.51	179	.50
1.3	18	.54	22	.53	29	.53	43	.53	84	.52	166	.51
1.4	17	.52	21	.54	27	.51	40	.52	78	.51	154	.50
1.5	17	.61	20	.54	26	.54	38	.53	73	.51	144	.50
1.6	16	.56	19	.52	25	.56	36	.53	69	.51	136	.51
1.7	16	.63	19	.60	24	.56	34	.53	65	.51	128	.51
1.8	15	.56	18	.57	23	.56	32	.50	62	.51	121	.50
1.9	15	.63	17	.52	22	.56	31	.52	59	.51	115	.51
2.0	14	.52	17	.58	21	.54	30	.54	56	.50	110	.51
2.2	14	.64	16	.58	20	.57	28	.55	52	.52	100	.50
2.4	13	.54	15	.54	19	.58	26	.54	48	.52	92	.50
2.6	13	.63	15	.64	18	.58	24	.51	45	.53	86	.51
2.8	13	.72	14	.56	17	.56	23	.53	42	.52	80	.51
3.0	12	.55	14	.64	16	.51	22	.54	40	.54	75	.51

* M = TEST TIME/DURABILITY CRITERION

TABLE F-1. (CONT'D) SAMPLING PLAN FOR THE DURABILITY OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .50
NUMBER OF FAILURES (C) = 25

M *	DURABILITY .50 N	.50 TRUE C.L.	.60 N	.60 TRUE C.L.	.70 N	.70 TRUE C.L.	.80 N	.80 TRUE C.L.	.90 N	.90 TRUE C.L.	.95 N	.95 TRUE C.L.
1.0	51	.50	64	.51	86	.52	129	.52	257	.51	514	.50
1.1	48	.51	60	.53	79	.51	118	.51	235	.51	468	.50
1.2	46	.56	56	.52	74	.52	109	.50	216	.50	430	.50
1.3	43	.51	53	.52	69	.51	102	.51	201	.51	398	.50
1.4	41	.50	50	.51	65	.50	96	.52	187	.50	371	.51
1.5	40	.55	48	.52	62	.52	90	.50	176	.51	347	.50
1.6	38	.50	46	.52	59	.51	86	.52	166	.51	326	.50
1.7	37	.53	44	.51	57	.54	81	.50	157	.51	308	.51
1.8	36	.53	43	.55	54	.51	78	.52	149	.51	291	.50
1.9	35	.53	41	.50	52	.51	74	.50	142	.51	277	.51
2.0	34	.51	40	.52	50	.50	71	.50	135	.50	263	.50
2.2	33	.57	38	.53	47	.51	66	.51	124	.50	241	.51
2.4	32	.60	36	.50	45	.55	62	.52	115	.51	222	.51
2.6	31	.59	35	.55	43	.56	58	.50	107	.50	206	.51
2.8	30	.56	34	.57	41	.56	55	.50	101	.52	192	.51
3.0	29	.50	33	.58	39	.52	53	.54	95	.52	180	.50

* M = TEST TIME/DURABILITY CRITERION

APPENDIX G. TABLE G-1. SAMPLING PLAN FOR M FOR IFRA DISTRIBUTIONS

TABLE G-1. SAMPLING PLAN FOR M FOR IFRA DISTRIBUTIONS

NUMBER OF UNITS (N) = 2
NUMBER OF FAILURES (C) = 0

	DURABILITY							
CONF.	.50	.60	.70	.75	.80	.85	.90	.95
.50	******	******	******	1.205	1.553	2.133	3.289	6.757
.60	******	******	1.284	1.593	2.053	2.819	4.348	8.932
.70	******	1.178	1.688	2.093	2.698	3.704	5.714	11.736
.75	1.000	1.357	1.943	2.409	3.106	4.265	6.579	13.513
.80	1.161	1.575	2.256	2.797	3.606	4.952	7.638	15.689
.85	1.368	1.857	2.659	3.297	4.251	5.837	9.003	18.493
.90	1.661	2.254	3.228	4.002	5.159	7.084	10.927	22.445
.95	2.161	2.932	4.200	5.207	6.713	9.217	14.217	29.202
.99	3.322	4.508	6.456	8.004	10.319	14.168	21.854	44.891

****** = M < 1
RECOMMENDATION: 1 < M < 3

TABLE G-1. (CONT'D) SAMPLING PLAN FOR M FOR IFRA DISTRIBUTIONS

NUMBER OF UNITS (N) = 3
NUMBER OF FAILURES (C) = 0

CONF.	DURABILITY .50	.60	.70	.75	.80	.85	.90	.95
.50	******	******	******	******	1.035	1.422	2.193	4.504
.60	******	******	******	1.062	1.369	1.879	2.899	5.955
.70	******	******	1.125	1.395	1.799	2.469	3.809	7.824
.75	******	******	1.296	1.606	2.071	2.843	4.386	9.009
.80	******	1.050	1.504	1.865	2.404	3.301	5.092	10.459
.85	******	1.238	1.773	2.198	2.834	3.891	6.002	12.329
.90	1.107	1.503	2.152	2.668	3.440	4.723	7.285	14.964
.95	1.441	1.955	2.800	3.471	4.475	6.144	9.478	19.468
.99	2.215	3.005	4.304	5.336	6.879	9.445	14.570	29.927

****** = M < 1
RECOMMENDATION: 1 < M < 3

TABLE G-1. (CONT'D) SAMPLING PLAN FOR M FOR IFRA DISTRIBUTIONS

NUMBER OF UNITS (N) = 4
NUMBER OF FAILURES (C) = 0

CONF.	DURABILITY .50	.60	.70	.75	.80	.85	.90	.95
.50	******	******	******	******	******	1.066	1.645	3.378
.60	******	******	******	******	1.027	1.410	2.174	4.466
.70	******	******	******	1.046	1.349	1.852	2.857	5.868
.75	******	******	******	1.205	1.553	2.133	3.289	6.757
.80	******	******	1.128	1.399	1.803	2.476	3.819	7.844
.85	******	******	1.330	1.649	2.125	2.918	4.501	9.246
.90	******	1.127	1.614	2.001	2.580	3.542	5.464	11.223
.95	1.080	1.466	2.100	2.603	3.356	4.608	7.108	14.601
.99	1.661	2.254	3.228	4.002	5.159	7.084	10.927	22.445

****** = M < 1
RECOMMENDATION: 1 < M < 3

TABLE G-1. (CONT'D) SAMPLING PLAN FOR M FOR IFRA DISTRIBUTIONS

NUMBER OF UNITS (N) = 5
NUMBER OF FAILURES (C) = 0

	DURABILITY							
CONF.	.50	.60	.70	.75	.80	.85	.90	.95
.50	******	******	******	******	******	******	1.316	2.703
.60	******	******	******	******	******	1.128	1.739	3.573
.70	******	******	******	******	1.079	1.482	2.285	4.694
.75	******	******	******	******	1.243	1.706	2.632	5.405
.80	******	******	******	1.119	1.443	1.981	3.055	6.275
.85	******	******	1.064	1.319	1.700	2.335	3.601	7.397
.90	******	******	1.291	1.601	2.064	2.834	4.371	8.978
.95	******	1.173	1.680	2.083	2.685	3.687	5.687	11.681
.99	1.329	1.803	2.582	3.202	4.128	5.667	8.742	17.956

****** = M < 1
RECOMMENDATION: 1 < M < 3

TABLE G-1. (CONT'D) SAMPLING PLAN FOR M FOR IFRA DISTRIBUTIONS

NUMBER OF UNITS (N) = 6
NUMBER OF FAILURES (C) = 0

CONF.	DURABILITY .50	.60	.70	.75	.80	.85	.90	.95
.50	******	******	******	******	******	******	1.096	2.252
.60	******	******	******	******	******	******	1.449	2.977
.70	******	******	******	******	******	1.235	1.905	3.912
.75	******	******	******	******	1.035	1.422	2.193	4.504
.80	******	******	******	******	1.202	1.651	2.546	5.230
.85	******	******	******	1.099	1.417	1.946	3.001	6.164
.90	******	******	1.076	1.334	1.720	2.361	3.642	7.482
.95	******	******	1.400	1.736	2.238	3.072	4.739	9.734
.99	1.107	1.503	2.152	2.668	3.440	4.723	7.285	14.964

****** = M < 1
RECOMMENDATION: 1 < M < 3

TABLE G-1. (CONT'D) SAMPLING PLAN FOR M FOR IFRA DISTRIBUTIONS

NUMBER OF UNITS (N) = 7
NUMBER OF FAILURES (C) = 0

	DURABILITY							
CONF.	.50	.60	.70	.75	.80	.85	.90	.95
.50	******	******	******	******	******	******	******	1.930
.60	******	******	******	******	******	******	1.242	2.552
.70	******	******	******	******	******	1.058	1.632	3.353
.75	******	******	******	******	******	1.219	1.880	3.861
.80	******	******	******	******	1.030	1.415	2.182	4.482
.85	******	******	******	******	1.215	1.668	2.572	5.284
.90	******	******	******	1.143	1.474	2.024	3.122	6.413
.95	******	******	1.200	1.488	1.918	2.633	4.062	8.343
.99	******	1.288	1.844	2.287	2.948	4.048	6.244	12.826

****** = M < 1
RECOMMENDATION: 1 < M < 3

TABLE G-1. (CONT'D) SAMPLING PLAN FOR M FOR IFRA DISTRIBUTIONS

NUMBER OF UNITS (N) = 8
NUMBER OF FAILURES (C) = 0

CONF.	DURABILITY .50	.60	.70	.75	.80	.85	.90	.95
.50	******	******	******	******	******	******	******	1.689
.60	******	******	******	******	******	******	1.087	2.233
.70	******	******	******	******	******	******	1.428	2.934
.75	******	******	******	******	******	1.066	1.645	3.378
.80	******	******	******	******	******	1.238	1.909	3.922
.85	******	******	******	******	1.063	1.459	2.251	4.623
.90	******	******	******	1.000	1.290	1.771	2.732	5.611
.95	******	******	1.050	1.302	1.678	2.304	3.554	7.300
.99	******	1.127	1.614	2.001	2.580	3.542	5.464	11.223

****** = M < 1
RECOMMENDATION: 1 < M < 3

TABLE G-1. (CONT'D) SAMPLING PLAN FOR M FOR IFRA DISTRIBUTIONS

NUMBER OF UNITS (N) = 9
NUMBER OF FAILURES (C) = 0

	DURABILITY							
CONF.	.50	.60	.70	.75	.80	.85	.90	.95
.50	******	******	******	******	******	******	******	1.501
.60	******	******	******	******	******	******	******	1.985
.70	******	******	******	******	******	******	1.270	2.608
.75	******	******	******	******	******	******	1.462	3.003
.80	******	******	******	******	******	1.100	1.697	3.486
.85	******	******	******	******	******	1.297	2.001	4.110
.90	******	******	******	******	1.147	1.574	2.428	4.988
.95	******	******	******	1.157	1.492	2.048	3.159	6.489
.99	******	1.002	1.435	1.779	2.293	3.148	4.857	9.976

****** = M < 1
RECOMMENDATION: 1 < M < 3

TABLE G-1. (CONT'D) SAMPLING PLAN FOR M FOR IFRA DISTRIBUTIONS

NUMBER OF UNITS (N) = 10
NUMBER OF FAILURES (C) = 0

	DURABILITY							
CONF.	.50	.60	.70	.75	.80	.85	.90	.95
.50	******	******	******	******	******	******	******	1.351
.60	******	******	******	******	******	******	******	1.786
.70	******	******	******	******	******	******	1.143	2.347
.75	******	******	******	******	******	******	1.316	2.703
.80	******	******	******	******	******	******	1.528	3.138
.85	******	******	******	******	******	1.167	1.801	3.699
.90	******	******	******	******	1.032	1.417	2.185	4.489
.95	******	******	******	1.041	1.343	1.843	2.843	5.840
.99	******	******	1.291	1.601	2.064	2.834	4.371	8.978

****** = M < 1
RECOMMENDATION: 1 < M < 3

TABLE G-1. (CONT'D) SAMPLING PLAN FOR M FOR IFRA DISTRIBUTIONS

NUMBER OF UNITS (N) = 2
NUMBER OF FAILURES (C) = 1

CONF.	DURABILITY .50	.60	.70	.75	.80	.85	.90	.95
.50	1.772	2.404	3.443	4.268	5.503	7.556	11.655	23.940
.60	2.149	2.917	4.177	5.179	6.677	9.167	14.141	29.046
.70	2.614	3.547	5.080	6.298	8.120	11.149	17.197	35.325
.75	2.900	3.935	5.636	6.987	9.008	12.368	19.078	39.188
.80	3.244	4.401	6.304	7.815	10.076	13.834	21.340	43.833
.85	3.680	4.993	7.151	8.866	11.430	15.693	24.207	49.723
.90	4.284	5.814	8.326	10.323	13.309	18.273	28.186	57.897
.95	5.304	7.196	10.307	12.778	16.474	22.620	34.891	71.669
.99	7.640	10.367	14.847	18.408	23.732	32.585	50.263	******

****** = M < 1
RECOMMENDATION: 1 < M < 3

TABLE G-1. (CONT'D) SAMPLING PLAN FOR M FOR IFRA DISTRIBUTIONS

NUMBER OF UNITS (N) = 3
NUMBER OF FAILURES (C) = 1

CONF.	DURABILITY .50	.60	.70	.75	.80	.85	.90	.95
.50	1.000	1.357	1.943	2.409	3.106	4.265	6.579	13.513
.60	1.208	1.639	2.347	2.910	3.752	5.151	7.946	16.321
.70	1.461	1.982	2.839	3.520	4.538	6.231	9.611	19.742
.75	1.615	2.192	3.139	3.892	5.018	6.890	10.628	21.831
.80	1.800	2.443	3.498	4.337	5.592	7.678	11.843	24.326
.85	2.033	2.758	3.950	4.898	6.314	8.669	13.373	27.468
.90	2.353	3.192	4.572	5.668	7.308	10.034	15.477	31.791
.95	2.885	3.915	5.607	6.952	8.962	12.306	18.981	38.989
.99	4.086	5.544	7.940	9.844	12.691	17.425	26.878	55.210

****** = M < 1
RECOMMENDATION: 1 < M < 3

TABLE G-1. (CONT'D) SAMPLING PLAN FOR M FOR IFRA DISTRIBUTIONS

NUMBER OF UNITS (N) = 4
NUMBER OF FAILURES (C) = 1

CONF.	DURABILITY .50	.60	.70	.75	.80	.85	.90	.95
.50	******	******	1.366	1.694	2.184	2.999	4.625	9.501
.60	******	1.151	1.648	2.044	2.635	3.617	5.580	11.461
.70	1.024	1.390	1.991	2.468	3.182	4.369	6.740	13.844
.75	1.132	1.536	2.200	2.727	3.516	4.827	7.446	15.296
.80	1.260	1.710	2.449	3.036	3.914	5.374	8.289	17.027
.85	1.421	1.928	2.761	3.424	4.414	6.060	9.348	19.202
.90	1.642	2.228	3.191	3.956	5.100	7.002	10.801	22.186
.95	2.008	2.725	3.902	4.838	6.238	8.565	13.211	27.136
.99	2.828	3.837	5.495	6.813	8.783	12.060	18.602	38.210

****** = M < 1
RECOMMENDATION: 1 < M < 3

TABLE G-1. (CONT'D) SAMPLING PLAN FOR M FOR IFRA DISTRIBUTIONS

NUMBER OF UNITS (N) = 5
NUMBER OF FAILURES (C) = 1

	DURABILITY							
CONF.	.50	.60	.70	.75	.80	.85	.90	.95
.50	******	******	1.056	1.309	1.688	2.317	3.574	7.342
.60	******	******	1.273	1.579	2.035	2.794	4.310	8.853
.70	******	1.073	1.537	1.906	2.457	3.373	5.203	10.687
.75	******	1.185	1.698	2.105	2.713	3.726	5.747	11.804
.80	******	1.319	1.889	2.342	3.019	4.146	6.394	13.135
.85	1.096	1.487	2.129	2.640	3.403	4.673	7.208	14.805
.90	1.265	1.716	2.458	3.048	3.929	5.395	8.322	17.094
.95	1.545	2.097	3.003	3.724	4.801	6.591	10.167	20.884
.99	2.171	2.946	4.219	5.231	6.743	9.259	14.282	29.336

****** = M < 1
RECOMMENDATION: 1 < M < 3

TABLE G-1. (CONT'D) SAMPLING PLAN FOR M FOR IFRA DISTRIBUTIONS

NUMBER OF UNITS (N) = 6
NUMBER OF FAILURES (C) = 1

CONF.	DURABILITY .50	.60	.70	.75	.80	.85	.90	.95
.50	******	******	******	1.068	1.376	1.890	2.915	5.988
.60	******	******	1.038	1.287	1.659	2.278	3.514	7.218
.70	******	******	1.253	1.553	2.003	2.750	4.241	8.712
.75	******	******	1.383	1.715	2.211	3.036	4.683	9.620
.80	******	1.075	1.539	1.908	2.460	3.378	5.210	10.702
.85	******	1.211	1.734	2.150	2.772	3.806	5.871	12.060
.90	1.030	1.398	2.002	2.482	3.200	4.393	6.777	13.920
.95	1.258	1.707	2.444	3.030	3.907	5.364	8.275	16.997
.99	1.765	2.394	3.429	4.252	5.481	7.526	11.609	23.846

****** = M < 1
RECOMMENDATION: 1 < M < 3

TABLE G-1. (CONT'D) SAMPLING PLAN FOR M FOR IFRA DISTRIBUTIONS

NUMBER OF UNITS (N) = 7
NUMBER OF FAILURES (C) = 1

CONF.	DURABILITY .50	.60	.70	.75	.80	.85	.90	.95
.50	******	******	******	******	1.163	1.596	2.462	5.057
.60	******	******	******	1.087	1.401	1.924	2.968	6.096
.70	******	******	1.058	1.311	1.691	2.322	3.581	7.356
.75	******	******	1.168	1.448	1.867	2.563	3.954	8.122
.80	******	******	1.299	1.611	2.077	2.851	4.398	9.034
.85	******	1.022	1.464	1.815	2.340	3.213	4.956	10.179
.90	******	1.179	1.689	2.094	2.700	3.707	5.719	11.746
.95	1.061	1.440	2.062	2.556	3.296	4.525	6.980	14.338
.99	1.488	2.018	2.891	3.584	4.621	6.344	9.786	20.101

****** = M < 1
RECOMMENDATION: 1 < M < 3

TABLE G-1. (CONT'D) SAMPLING PLAN FOR M FOR IFRA DISTRIBUTIONS

NUMBER OF UNITS (N) = 8
NUMBER OF FAILURES (C) = 1

CONF.	DURABILITY .50	.60	.70	.75	.80	.85	.90	.95
.50	******	******	******	******	1.006	1.382	2.131	4.378
.60	******	******	******	******	1.213	1.665	2.569	5.277
.70	******	******	******	1.135	1.463	2.009	3.099	6.366
.75	******	******	1.011	1.253	1.616	2.218	3.422	7.029
.80	******	******	1.124	1.394	1.797	2.468	3.806	7.818
.85	******	******	1.267	1.570	2.025	2.780	4.288	8.808
.90	******	1.020	1.462	1.812	2.336	3.208	4.948	10.163
.95	******	1.245	1.784	2.211	2.851	3.914	6.038	12.402
.99	1.286	1.745	2.499	3.099	3.995	5.485	8.461	17.379

****** = M < 1
RECOMMENDATION: 1 < M < 3

TABLE G-1. (CONT'D) SAMPLING PLAN FOR M FOR IFRA DISTRIBUTIONS

NUMBER OF UNITS (N) = 9
NUMBER OF FAILURES (C) = 1

CONF.	DURABILITY .50	.60	.70	.75	.80	.85	.90	.95
.50	******	******	******	******	******	1.218	1.879	3.860
.60	******	******	******	******	1.069	1.468	2.265	4.652
.70	******	******	******	1.001	1.290	1.771	2.732	5.612
.75	******	******	******	1.105	1.424	1.956	3.017	6.196
.80	******	******	******	1.229	1.584	2.175	3.355	6.892
.85	******	******	1.116	1.384	1.785	2.450	3.780	7.764
.90	******	******	1.288	1.597	2.059	2.827	4.361	8.957
.95	******	1.097	1.572	1.949	2.512	3.449	5.321	10.929
.99	1.133	1.537	2.202	2.730	3.519	4.832	7.454	15.311

****** = M < 1
RECOMMENDATION: 1 < M < 3

TABLE G-1. (CONT'D) SAMPLING PLAN FOR M FOR IFRA DISTRIBUTIONS

NUMBER OF UNITS (N) = 10
NUMBER OF FAILURES (C) = 1

	DURABILITY							
CONF.	.50	.60	.70	.75	.80	.85	.90	.95
.50	******	******	******	******	******	1.089	1.680	3.452
.60	******	******	******	******	******	1.313	2.025	4.160
.70	******	******	******	******	1.154	1.584	2.443	5.018
.75	******	******	******	******	1.274	1.749	2.697	5.540
.80	******	******	******	1.099	1.416	1.945	3.000	6.162
.85	******	******	******	1.238	1.596	2.191	3.379	6.941
.90	******	******	1.152	1.428	1.841	2.527	3.899	8.008
.95	******	******	1.405	1.742	2.246	3.084	4.756	9.770
.99	1.013	1.374	1.968	2.440	3.145	4.319	6.662	13.684

****** = M < 1
RECOMMENDATION: 1 < M < 3

APPENDIX H. TABLE H-1. SAMPLING PLAN FOR THE MEAN OF IFRA DISTRIBUTIONS

TABLE H-1.

SAMPLING PLAN FOR THE MEAN OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .95

M *	C = 0		1		2		3		4		5	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.1	16	.95	25	.95	34	.95	42	.95	50	.95	57	.95
1.2	8	.95	14	.96	18	.95	23	.96	27	.96	31	.95
1.3	6	.96	10	.97	13	.96	16	.96	19	.95	22	.95
1.4	5	.97	8	.97	10	.95	13	.96	15	.95	18	.96
1.5	4	.97	6	.95	9	.97	11	.96	13	.96	15	.95
1.6	3	.95	6	.98	8	.97	10	.97	12	.97	14	.97
1.7	3	.97	5	.97	7	.97	9	.97	11	.97	12	.96
1.8	3	.98	5	.98	6	.95	8	.96	10	.97	11	.95
1.9	3	.99	4	.96	6	.97	8	.98	9	.96	11	.98
2.0	2	.96	4	.97	6	.98	7	.96	9	.98	10	.97
2.2	2	.98	4	.99	5	.97	7	.99	8	.98	9	.96
2.4	2	.99	3	.96	5	.99	6	.97	7	.96	9	.98
2.6	2	.99	3	.97	4	.95	6	.99	7	.98	8	.97
2.8	2	.99	3	.98	4	.97	5	.95	7	.99	8	.98
3.0	2	1.00	3	.99	4	.98	5	.97	6	.95	8	.99

* M = TEST TIME/DURABILITY CRITERION

TABLE H-1. (CONT'D)

DESIRED CONFIDENCE LEVEL = .95

M *	C = 6		7		8		9		10	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.1	65	.95	72	.95	79	.95	86	.95	93	.95
1.2	35	.95	39	.95	43	.95	47	.95	51	.96
1.3	25	.95	28	.95	31	.96	34	.96	37	.96
1.4	20	.95	23	.96	25	.96	27	.95	30	.96
1.5	17	.95	19	.95	21	.95	24	.97	26	.97
1.6	15	.95	17	.96	19	.96	21	.96	23	.97
1.7	14	.96	16	.97	17	.95	19	.96	21	.97
1.8	13	.97	15	.97	16	.96	18	.97	19	.96
1.9	12	.96	14	.97	15	.96	17	.97	18	.96
2.0	12	.98	13	.97	14	.95	16	.97	17	.96
2.2	11	.98	12	.97	13	.96	15	.98	16	.97
2.4	10	.98	11	.96	12	.95	14	.98	15	.97
2.6	9	.95	11	.98	12	.98	13	.97	14	.96
2.8	9	.97	10	.97	11	.96	13	.99	14	.98
3.0	9	.99	10	.98	11	.98	12	.97	13	.96

* M = TEST TIME/DURABILITY CRITERION

TABLE H-1. (CONT'D) SAMPLING PLAN FOR THE MEAN OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .90

M *	C = 0		1		2		3		4		5	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.1	12	.90	21	.91	29	.91	37	.91	44	.91	51	.91
1.2	7	.93	11	.90	16	.92	20	.91	24	.91	28	.91
1.3	5	.94	8	.92	11	.91	14	.91	17	.91	20	.91
1.4	4	.94	6	.90	9	.92	11	.90	14	.92	16	.91
1.5	3	.93	6	.95	8	.94	10	.93	12	.93	14	.92
1.6	3	.95	5	.94	7	.94	9	.94	11	.94	12	.91
1.7	2	.90	4	.91	6	.92	8	.93	10	.95	11	.91
1.8	2	.93	4	.94	6	.95	7	.91	9	.94	11	.95
1.9	2	.95	4	.96	5	.91	7	.94	8	.91	10	.94
2.0	2	.96	4	.97	5	.94	7	.96	8	.94	9	.91
2.2	2	.98	3	.93	5	.97	6	.95	7	.92	9	.96
2.4	2	.99	3	.96	4	.93	6	.97	7	.96	8	.94
2.6	1	.90	3	.97	4	.95	5	.93	7	.98	8	.97
2.8	1	.92	3	.98	4	.97	5	.95	6	.93	7	.91
3.0	1	.94	3	.99	4	.98	5	.97	6	.95	7	.94

* M = TEST TIME/DURABILITY CRITERION

TABLE H-1. (CONT'D)

DESIRED CONFIDENCE LEVEL = .90

M *	C = 6		7		8		9		10	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.1	58	.91	65	.91	72	.91	78	.90	85	.90
1.2	32	.92	35	.90	39	.90	43	.91	47	.91
1.3	23	.92	26	.92	28	.90	31	.91	34	.91
1.4	19	.93	21	.92	23	.91	25	.91	28	.93
1.5	16	.92	18	.92	20	.92	22	.92	24	.92
1.6	14	.91	16	.92	18	.93	20	.94	21	.91
1.7	13	.93	15	.94	16	.91	18	.93	19	.90
1.8	12	.93	14	.95	15	.92	17	.94	18	.92
1.9	11	.91	13	.94	14	.92	16	.94	17	.92
2.0	11	.95	12	.92	14	.95	15	.93	16	.91
2.2	10	.94	11	.92	13	.96	14	.95	15	.93
2.4	9	.91	11	.96	12	.95	13	.94	14	.92
2.6	9	.95	10	.94	11	.92	12	.90	14	.96
2.8	9	.97	10	.97	11	.96	12	.94	13	.93
3.0	8	.92	9	.90	11	.98	12	.97	13	.96

* M = TEST TIME/DURABILITY CRITERION

TABLE H-1. (CONT'D) SAMPLING PLAN FOR THE MEAN OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .80

M *	C = 0		1		2		3		4		5	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.1	9	.83	16	.80	24	.82	31	.82	37	.80	44	.81
1.2	5	.85	9	.83	13	.83	17	.83	20	.80	24	.81
1.3	3	.81	6	.80	9	.81	12	.82	15	.83	18	.84
1.4	3	.88	5	.83	8	.87	10	.85	12	.83	14	.81
1.5	2	.83	4	.80	7	.89	9	.88	10	.80	12	.81
1.6	2	.87	4	.87	6	.87	8	.88	9	.81	11	.84
1.7	2	.90	4	.91	5	.83	7	.86	9	.89	10	.83
1.8	2	.93	3	.82	5	.88	6	.80	8	.86	10	.90
1.9	2	.95	3	.86	5	.91	6	.86	8	.91	9	.86
2.0	2	.96	3	.89	4	.81	6	.90	7	.85	9	.91
2.2	1	.84	3	.93	4	.88	5	.82	7	.92	8	.88
2.4	1	.88	3	.96	4	.93	5	.89	6	.84	8	.94
2.6	1	.90	2	.82	4	.95	5	.93	6	.90	7	.86
2.8	1	.92	2	.86	4	.97	5	.95	6	.93	7	.91
3.0	1	.94	2	.88	3	.83	5	.97	6	.95	7	.94

* M = TEST TIME/DURABILITY CRITERION

TABLE H-1. (CONT'D)

DESIRED CONFIDENCE LEVEL = .80

M *	C = 6		7		8		9		10	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.1	50	.80	57	.81	63	.80	70	.81	76	.81
1.2	28	.82	31	.80	35	.82	39	.83	42	.81
1.3	20	.81	23	.83	26	.84	28	.81	31	.83
1.4	17	.86	19	.84	21	.83	23	.83	25	.82
1.5	14	.82	16	.82	18	.83	20	.84	22	.84
1.6	13	.86	15	.87	16	.82	18	.84	20	.86
1.7	12	.87	13	.82	15	.85	16	.80	18	.84
1.8	11	.86	12	.80	14	.85	15	.81	17	.86
1.9	10	.81	12	.88	13	.84	15	.89	16	.85
2.0	10	.87	11	.83	13	.90	14	.86	15	.83
2.2	9	.85	10	.80	12	.90	13	.87	14	.84
2.4	9	.91	10	.89	11	.86	12	.83	14	.92
2.6	8	.83	10	.94	11	.92	12	.90	13	.88
2.8	8	.88	9	.86	10	.83	11	.80	13	.93
3.0	8	.92	9	.90	10	.88	11	.86	12	.84

* M = TEST TIME/DURABILITY CRITERION

TABLE H-1. (CONT'D) SAMPLING PLAN FOR THE MEAN OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .70

M *	C = 0		1		2		3		4		5	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.1	6	.73	12	.72	18	.72	24	.73	29	.70	35	.72
1.2	4	.78	8	.77	11	.72	15	.74	18	.71	22	.73
1.3	3	.81	5	.70	8	.73	11	.76	13	.71	16	.74
1.4	2	.76	4	.70	7	.79	9	.77	11	.75	13	.74
1.5	2	.83	4	.80	6	.80	8	.80	10	.80	11	.71
1.6	2	.87	3	.71	5	.75	7	.79	9	.81	10	.73
1.7	2	.90	3	.77	5	.83	6	.73	8	.79	9	.71
1.8	1	.73	3	.82	4	.71	6	.8C	7	.72	9	.80
1.9	1	.77	3	.86	4	.77	6	.86	7	.79	8	.72
2.0	1	.80	3	.89	4	.81	5	.73	7	.85	8	.79
2.2	1	.84	2	.71	4	.88	5	.82	6	.76	8	.88
2.4	1	.88	2	.77	4	.93	5	.89	6	.84	7	.80
2.6	1	.90	2	.82	3	.74	5	.93	6	.90	7	.86
2.8	1	.92	2	.86	3	.79	4	.73	6	.93	7	.91
3.0	1	.94	2	.88	3	.83	4	.78	5	.74	7	.94

* M = TEST TIME/DURABILITY CRITERION

TABLE H-1. (CONT'D)

DESIRED CONFIDENCE LEVEL = .70

M *	C = 6		7		8		9		10	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.1	40	.70	46	.71	51	.70	57	.71	62	.70
1.2	25	.71	29	.73	32	.72	36	.74	39	.72
1.3	19	.76	21	.73	24	.75	26	.72	29	.74
1.4	15	.73	17	.72	19	.71	21	.70	24	.76
1.5	13	.73	15	.74	17	.76	19	.77	20	.70
1.6	12	.77	14	.80	15	.73	17	.77	18	.70
1.7	11	.77	12	.70	14	.76	16	.80	17	.75
1.8	10	.73	12	.80	13	.75	15	.81	16	.76
1.9	10	.81	11	.76	12	.70	14	.79	15	.74
2.0	9	.73	11	.83	12	.79	13	.74	15	.83
2.2	9	.85	10	.80	11	.76	12	.71	14	.84
2.4	8	.75	10	.89	11	.86	12	.83	13	.80
2.6	8	.83	9	.79	10	.75	11	.72	13	.88
2.8	8	.88	9	.86	10	.83	11	.80	12	.77
3.0	8	.92	9	.90	10	.88	11	.86	12	.84

* M = TEST TIME/DURABILITY CRITERION

TABLE H-1. (CONT'D) SAMPLING PLAN FOR THE MEAN OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .60

M *	C = 0		1		2		3		4		5	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.1	3	.63	7	.63	11	.64	15	.65	18	.60	22	.61
1.2	3	.68	6	.61	10	.65	13	.62	17	.66	20	.63
1.3	2	.67	5	.70	7	.63	10	.67	12	.63	15	.67
1.4	2	.76	4	.70	6	.68	8	.66	10	.65	12	.64
1.5	2	.83	3	.62	5	.65	7	.68	9	.70	11	.71
1.6	1	.64	3	.71	5	.75	6	.63	8	.69	10	.73
1.7	1	.69	3	.77	4	.64	6	.73	7	.63	9	.71
1.8	1	.73	3	.82	4	.71	6	.80	7	.72	8	.63
1.9	1	.77	3	.86	4	.77	5	.67	7	.79	8	.72
2.0	1	.80	2	.63	4	.81	5	.73	6	.65	8	.79
2.2	1	.84	2	.71	3	.60	5	.82	6	.76	7	.70
2.4	1	.88	2	.77	3	.68	5	.89	6	.84	7	.80
2.6	1	.90	2	.82	3	.74	4	.67	5	.61	7	.86
2.8	1	.92	2	.86	3	.79	4	.73	5	.68	6	.63
3.0	1	.94	2	.88	3	.83	4	.78	5	.74	6	.69

* M = TEST TIME/DURABILITY CRITERION

TABLE H-1. (CONT'D)

DESIRED CONFIDENCE LEVEL = .60

M *	C = 6		7		8		9		10	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.1	26	.63	30	.64	33	.61	37	.62	41	.63
1.2	23	.62	27	.65	30	.63	33	.62	36	.60
1.3	17	.63	20	.66	22	.63	24	.60	27	.64
1.4	14	.64	16	.63	18	.63	20	.63	22	.62
1.5	12	.62	14	.64	16	.67	18	.69	19	.61
1.6	11	.65	13	.69	14	.62	16	.66	18	.70
1.7	10	.63	12	.70	13	.63	15	.70	16	.63
1.8	10	.73	11	.66	13	.75	14	.69	15	.63
1.9	9	.65	11	.76	12	.70	13	.64	15	.74
2.0	9	.73	10	.67	11	.61	13	.74	14	.69
2.2	8	.64	10	.80	11	.76	12	.71	13	.67
2.4	8	.75	9	.70	10	.65	11	.61	13	.80
2.6	8	.83	9	.79	10	.75	11	.72	12	.68
2.8	8	.88	9	.86	10	.83	11	.80	12	.77
3.0	7	.65	8	.61	10	.88	11	.86	12	.84

* M = TEST TIME/DURABILITY CRITERION

TABLE H-1. (CONT'D) SAMPLING PLAN FOR THE MEAN OF IFRA DISTRIBUTIONS

DESIRED CONFIDENCE LEVEL = .50

M *	C = 0		1		2		3		4		5	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.1	2	.59	5	.58	8	.59	10	.50	13	.52	16	.53
1.2	2	.62	5	.63	7	.54	10	.57	12	.51	15	.54
1.3	2	.67	4	.56	6	.50	9	.57	11	.53	14	.58
1.4	1	.51	3	.52	5	.52	7	.52	9	.53	11	.53
1.5	1	.58	3	.62	5	.65	6	.51	8	.55	10	.59
1.6	1	.64	3	.71	4	.55	6	.63	7	.51	9	.59
1.7	1	.69	3	.77	4	.64	5	.51	7	.63	8	.53
1.8	1	.73	2	.54	4	.71	5	.60	7	.72	8	.63
1.9	1	.77	2	.59	4	.77	5	.67	6	.58	8	.72
2.0	1	.80	2	.63	3	.51	5	.73	6	.65	7	.57
2.2	1	.84	2	.71	3	.60	4	.51	6	.76	7	.70
2.4	1	.88	2	.77	3	.68	4	.60	5	.52	7	.80
2.6	1	.90	2	.82	3	.74	4	.67	5	.61	6	.55
2.8	1	.92	2	.86	3	.79	4	.73	5	.68	6	.63
3.0	1	.94	2	.88	3	.83	4	.78	5	.74	6	.69

* M = TEST TIME/DURABILITY CRITERION

TABLE H-1. (CONT'D)

DESIRED CONFIDENCE LEVEL = .50

M *	C = 6		7		8		9		10	
	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.	N	TRUE C.L.
1.1	19	.54	22	.55	25	.56	27	.51	30	.52
1.2	18	.56	20	.52	23	.54	26	.56	28	.52
1.3	16	.55	18	.52	21	.56	23	.53	25	.51
1.4	13	.53	15	.53	17	.54	19	.54	21	.54
1.5	12	.62	13	.52	15	.56	17	.58	18	.50
1.6	11	.65	12	.56	14	.62	15	.54	17	.59
1.7	10	.63	11	.54	13	.63	14	.56	16	.63
1.8	9	.55	11	.66	12	.59	13	.53	15	.63
1.9	9	.65	10	.58	11	.51	13	.64	14	.58
2.0	9	.73	10	.67	11	.61	12	.55	14	.69
2.2	8	.64	9	.58	10	.52	12	.71	13	.67
2.4	8	.75	9	.70	10	.65	11	.61	12	.56
2.6	8	.83	9	.79	10	.75	11	.72	12	.68
2.8	7	.58	8	.54	10	.83	11	.80	12	.77
3.0	7	.65	8	.61	9	.58	10	.54	11	.51

* M = TEST TIME/DURABILITY CRITERION

NOTATION

$F(T)$	=	durability probability distribution function. The probability that a unit on test will fail on or before time T is given by F(T).
$R(T)$	=	1 - F(T) is the probability that a unit on test will survive longer than time T.
T	=	time of operation of a unit under specified operating conditions. Time is used in a general sense to represent miles, cycles, number of rounds, actual time, or any other measure of operation sequence.
$T*$	=	the required durability life for an item.
α	=	confidence coefficient. If, for example, $\alpha = .05$, then we would construct a $100(1 - \alpha)\% = 95\%$ lower confidence limit for R(T).
τ	=	the actual test time for all units which survive the durability test (often called test truncation time).
$R(\alpha,T)$	=	a $100(1 - \alpha)\%$ lower confidence limit for the durability life of an item relative to time T.
$\tilde{R}(\alpha,T)$	=	an approximate $100(1 - \alpha)\%$ lower confidence limit for the durability of an item relative to time T.
N	=	number of units on durability test.
r	=	number of units which survive the durability test.
C	=	N-r, the number of units which fail the durability test.

M	=	$\tau/T*$, is the normalized test time for surviving units, i.e., each unit which survives is on test for time $MT*$. For example, if the durability requirement is for a time $T* = 5000$ miles and surviving units are kept on test for $\tau = 8000$ miles, then $M = 8000/5000 = 1.6$.
$f(T)$	=	durability p.d.f. $= dF(T)/d(T)$
IFR	=	Increasing failure rate
IFRA	=	Increasing failure rate average
$R*$	=	Required durability relative to $T*$
$r(T)$	=	Failure rate for a durability distribution
$\bar{r}(T)$	=	Average value of $r(T)$

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